FINAL DRAFT

WATER QUALITY IMPROVEMENT STRATEGIES FOR THE EVERGLADES

PRELIMINARY ALTERNATIVE COMBINATIONS FOR THE ECP BASINS

October 30, 2001

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
West Palm Beach, Florida

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WATER QUALITY IMPROVEMENT STRATEGIES FOR THE EVERGLADES PRELIMINARY ALTERNATIVE COMBINATIONS FOR THE ECP BASINS

1.0 EXECUTIVE SUMMARY

Florida's 1994 Everglades Forever Act (Act) establishes both interim and long-term water quality goals to achieve restoration and protection of the Everglades Protection Area (EPA). The South Florida Water Management District (District), in partnership with other agencies and private landowners, is aggressively and successfully achieving these interim milestones. Basin-specific feasibility studies will evaluate alternative combinations of private works and public works to achieve compliance with the long-term water quality standards for the Everglades Protection Area. This document briefly describes the preliminary set of alternatives to be evaluated for the basins served by the Everglades Construction Project (ECP). A schematic of the ECP basins is presented in Figure 1.

STAKEHOLDERS WILL BE INVOLVED THROUGHOUT THE DEVELOPMENT AND EVALUATION OF ALTERNATIVES. Basin-specific characteristics will help shape the final alternatives. In order to reduce the number of different alternatives evaluated, a concerted effort will be made with the stakeholders of each basin to identify the most viable of the alternatives prior to conducting the evaluation of alternatives. Stakeholder input will be garnered through interactive development of the basin alternatives and updates during the evaluation process. **The District's STA Design Review Staff Meetings have been the central forums for discussion of the ECP basin alternatives.** For meeting dates and locations, please see

http://www.sfwmd.gov/gover/3_mtgcalndr.html

In addition, all draft documents will be available for public review and comment on the District's website,

http://www.sfwmd.gov/org/erd/bsfboard/bsfsboard.htm

1.1 Key Variables for Defining Alternatives

The following key variables were used in defining basin-specific alternatives for the ECP basins:

1. Operational changes, including diversion of flows
2. Basin-scale treatment, including biological and chemical treatment
3. Integration with CERP projects (see Table 1)

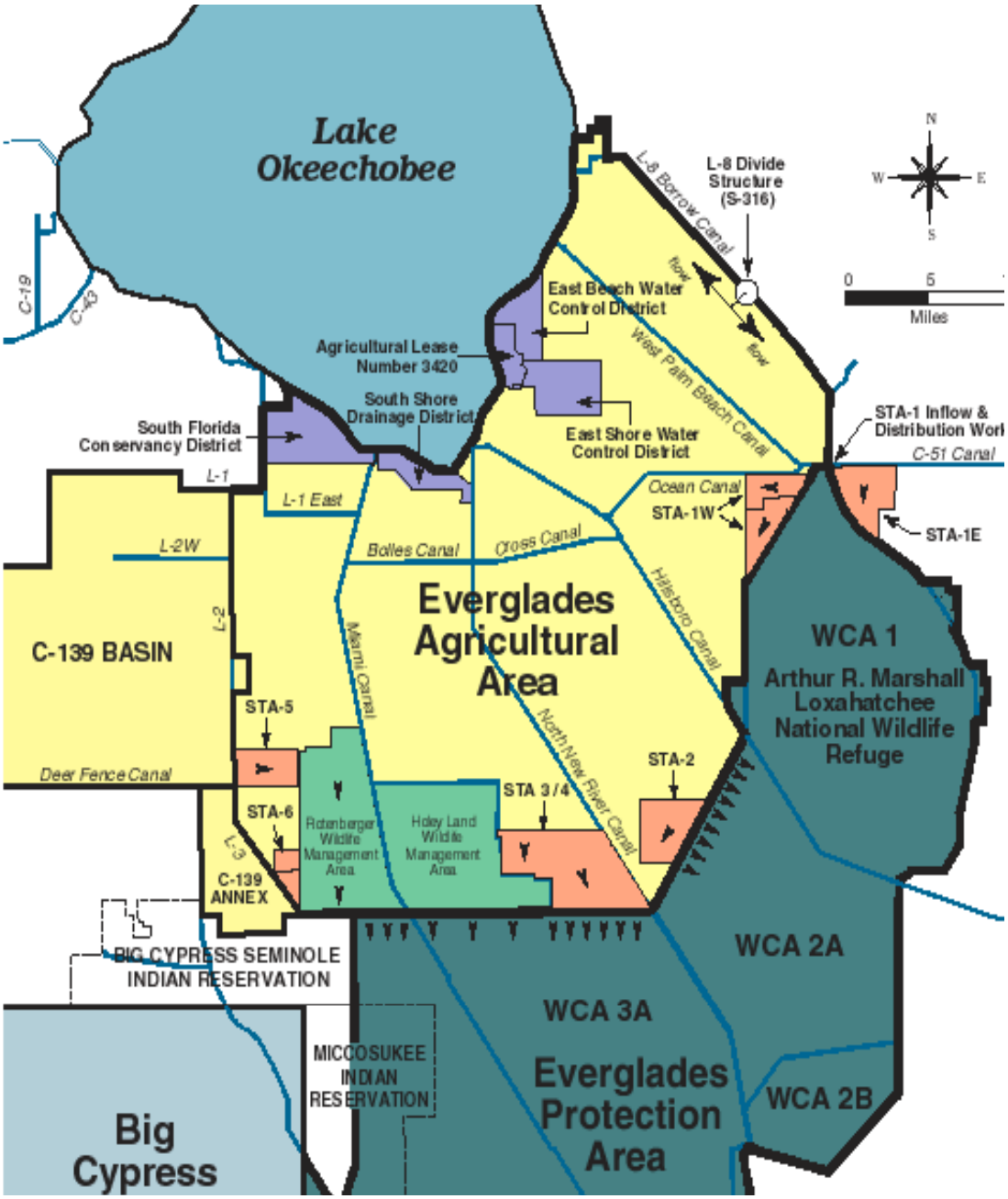


Figure 1. Overview of the Everglades Construction Project.

Table 1. CERP Projects That May Influence Flows and Loads in the ECP Basins

CERP Project	Completion Date	STA -1E	STA -1W	STA -2	STA -3/4	STA -5	STA -6
Rotenberger WMA Operations (EE5)	5/3/06				✔	✔	✔
Holey Land WMA Operations (DD)	3/26/08				✔	✔	
Pump Station G-404 Modification (II3)	9/24/08				✔		✔
EAA Reservoir Ph. I (G6)	**9/16/09**			✔(?)	✔	✔	✔
C-51 Backpump and Treatment (Y)	3/19/10	✔	✔				
L-8 Basin (K Ph 1)	3/18/11	✔	✔				
C-51 & Southern L-8 Reservoir (GGG6)	3/14/14	✔	✔				
L-8 Basin ASR (K Ph 2)	10/18/18	✔	✔				
C-51 Regional ASR (LL)	10/15/20	✔	✔				

CERP Projects in **Bold** were included in the initial project authorization in WRDA 2000. Completion dates taken from 7/27/2001 Update to CERP Master Implementation Schedule

2.0 GENERAL COMMENTS ON THE PRELIMINARY ALTERNATIVES

1. **Period of comparison.** To ensure valid comparisons among the alternatives for a specific basin, flows and phosphorus loads for each alternative will be estimated for a common period, from 12/31/2006 until 12/31/2056. This allows each alternative to consider the period prior to implementation of the relevant CERP project and the period after implementation of the relevant CERP project.

2. **Influence of source controls.** For the evaluation of alternatives, a sensitivity analysis will be performed to reflect varying degrees of phosphorus reduction due to source controls. It is anticipated that this sensitivity analysis will include reductions in phosphorus loads up to 25%, compared to the Baseline data set. The influence of these reductions on the outflow phosphorus concentrations of the alternative will be calculated and summarized. It will be assumed that there will be no change in the Baseline flows associated with source controls. The evaluation of alternatives will not include any cost information on source controls.

3. **Planning level phosphorus discharge target.** It has been suggested by external reviewers that the evaluation methodology include an additional planning level target for the basin discharge concentration other than 10 ppb, perhaps 20 ppb, to ensure that decision-makers realize that it may be infeasible to achieve 10 ppb. We feel that the formulation of the alternatives will yield a range of discharge concentrations, and all of them will be based on realistic, achievable performance (within the calibrated range of the DMSTA model), based on the best professional judgement of the staff and consultants involved. Hence, there is no need to have an additional target.

4. **Costs.** The evaluation will consider only incremental costs, i.e., in addition to costs already encumbered or budgeted to be spent, associated with specific alternatives. The costs associated with the first phase of the ECP will be considered sunk costs and will not be included. The evaluation will not include CERP project costs, as they should be the same among the alternatives for a specific basin.

5. **Influence of CERP Projects.** To estimate the influence of CERP projects on the flows to the STAs, a revised "Alt D13R" SFWMM simulation will be conducted that reflects the current configuration of the EAA Storage Reservoirs and refines the operations of the STAs. All other CERP projects will be modeled as they were in the original "Alt D13R". For the EAA Storage Reservoirs project, this revised simulation will represent a preliminary operational scenario for the reservoirs. This scenario may likely change during the development of the Project Implementation Report (PIR) for the EAA Storage Reservoirs project, however, the urgent time frame of these basin feasibility studies does not allow the opportunity to wait until after the PIR process finalizes the operational scenario. Any changes to the scenario used in these feasibility studies resulting from the PIR process will be reflected in the subsequent engineering phases of the long-term water quality solutions.

6. **Phosphorus model.** The Dynamic Model for Stormwater Treatment Areas (DMSTA) will be used to estimate the phosphorus load reduction of the specific alternatives. DMSTA will be used to model flows and phosphorus through the EAA Storage Reservoirs and existing and modified STAs. DMSTA can also be used to route flows through flow equalization basins and other components associated with chemical treatment facilities.

7. **Baseline Data Set.** The Baseline data set developed in a previous phase of the basin feasibility studies will serve as the basis for comparison of alternatives. For a complete description of the Baseline data set and the methodology used to develop the Baseline data set, refer to *Baseline Data for the Basin-Specific Feasibility Studies to achieve the long-term Water Quality Goals for the Everglades,* May 2001.

8. **Optimizing STA Performance.** For each of the STAs, at least one alternative will evaluate improving performance within the existing footprint by incorporating an optimal combination of biological technologies. There is general consensus that an emergent vegetation cell is desirable at the front end of the STA to act as a nutrient "shock absorber". Based on preliminary research results, it also appears that some combination of submerged aquatic vegetation (SAV) and periphyton-based communities would be more effective at reducing phosphorus concentrations than a system containing only emergent vegetation. However, there is not yet any guidance on the optimum partitioning of these three vegetation communities within an STA. For the purpose of discussing preliminary alternatives, it is proposed to assign a 25%/50%/25% partitioning for emergent/SAV/periphyton. During the actual evaluation of alternatives (Task 4), this partitioning may likely be revised based on locations of existing levees, existing treatment cell vegetation and observed phosphorus removal performance. For example, STA-2 Cells 1 and 2 are dominated by emergent vegetation and have recently been achieving phosphorus concentrations of around 20 ppb. As more information becomes available during the course of the feasibility studies, these partitions would likely change.

3.0 PRELIMINARY ALTERNATIVES FOR THE ECP BASINS

Preliminary combinations of operational changes, basin-scale treatment and CERP projects for the ECP basins are presented below. Because the ECP basins discharge to STAs, the evaluation will be STA-specific, i.e., alternatives are presented for STA-1E, STA-1W, STA-2, STA-3/4, STA-5, and STA-6. Major components of the alternatives, along with probable influences on the flows and phosphorus loads to the STAs are briefly described.

For the evaluation of alternatives, a sensitivity analysis will be performed to reflect varying degrees of phosphorus reduction due to source controls. It is anticipated that this sensitivity analysis will include reductions in phosphorus loads up to 25%, compared to the Baseline data set. The influence of these reductions on the outflow phosphorus concentrations of the alternative will be calculated and summarized. It will be assumed that there will be no change in the Baseline flows associated with source controls.

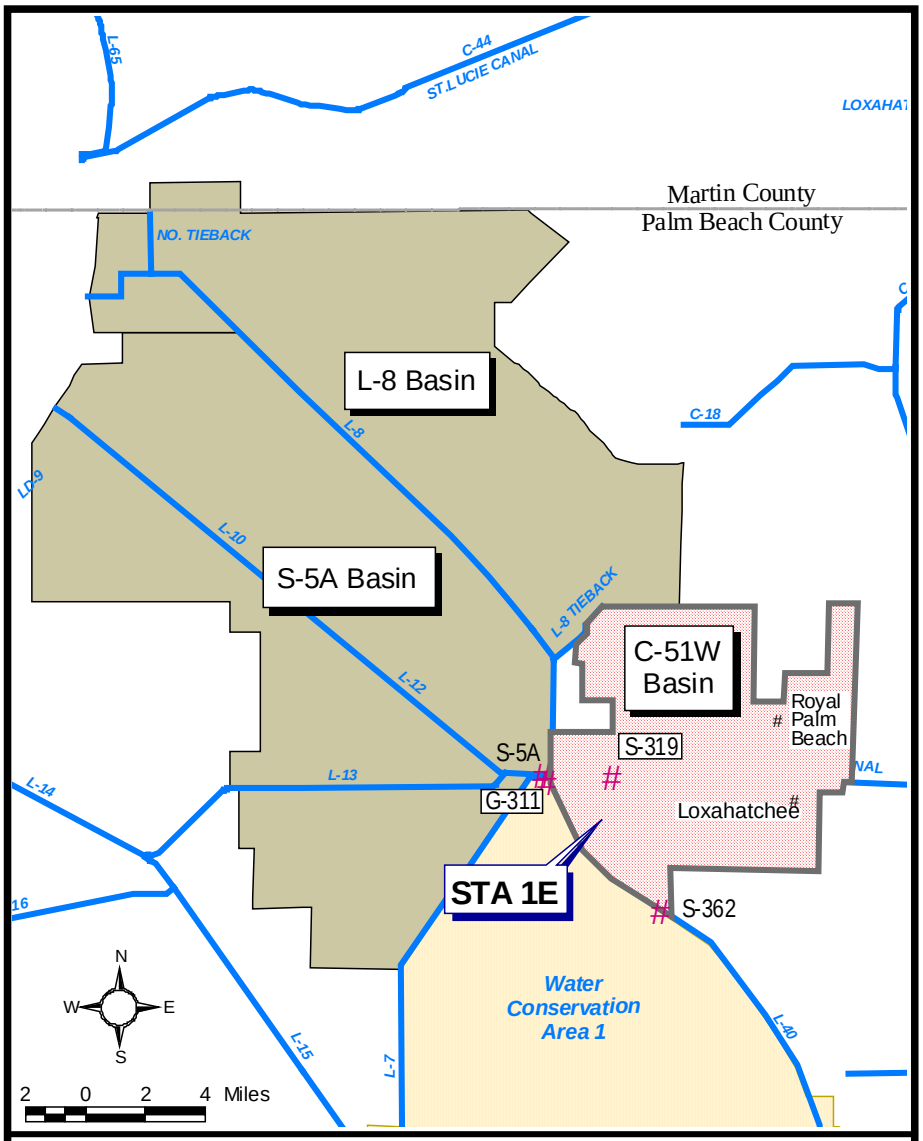
4.0 STA-1 EAST PRELIMINARY ALTERNATIVE COMBINATIONS

The C-51 West Basin has an area of 79.5 square miles and is located in eastern Palm Beach County. The project canals and water control structures in the basin have three primary functions: (1) to provide flood protection and drainage for the basin, (2) to pass through to tidewater, under certain conditions, discharges of flood flows from the L-8 Basin, and (3) to supply water to the basin during periods of low natural flow. C-51 is the primary canal in the C-51 West Basin. There are five project structures controlling flow in the basin: G-124, S-5AE, S-5AW, S-5AS, and S-5A.

The L-8 drainage basin is 171.2 square miles in area and is located in northwestern Palm Beach County and southwestern Martin County. The project canals and water control structures in the basin have four primary functions: (1) to protect the agricultural areas to the southwest of the L-8 basin by intercepting surface water flows originating in the L-8 basin; (2) to remove excess water from the L-8 Basin to storage in either Lake Okeechobee or Water Conservation Area 1(WCA 1); (3) to supply water from Lake Okeechobee or WCA 1 to the L-8 Basin for irrigation of agricultural lands; and (4) to transfer water from storage in WCA 1 to Lake Okeechobee. The project canals and water control structures in the basin have two secondary functions: (1) to supply water from the L-8 Basin, WCA 1 or Lake Okeechobee to the City of West Palm Beach water supply system and (2) to accept discharges of excess water from the City of West Palm Beach water supply system. There are three project canals in the L-8 Basin: (1) the L-8 borrow canal, (2) the North Tieback Levee borrow canal, and (3) the L-8 Tieback Levee borrow canal. There are seven project structures controlling flow in the L-8 Basin: S-5A, S-5AE, S-5AS, S-5AW, S-76, Culvert #10A, and an unnamed weir in the L-8 Tieback Levee borrow canal. The basins tributary to STA-1 East are presented in Figure 4-1. STA-1 East will treat stormwater flows from the C-51 West Basin, the S-5A Basin, at times the L-8 Canal Basin, and Lake Okeechobee releases during periods of high lake stages (if available treatment capacity exists in the treatment area). The Corps of Engineers is presently designing STA-1 East, and close coordination between the District and the Corps will continue into the design of long-term water quality solutions.

Note: The Baseline Flows and Phosphorus Loads shown in Figures 4-2 and 4-3 are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. For the water quality component, a regression relationship was developed between flow and phosphorus concentration. The resulting regression equation was applied to the simulated flows to create the 31-year period of Baseline flow and water quality data. Reference: Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001.

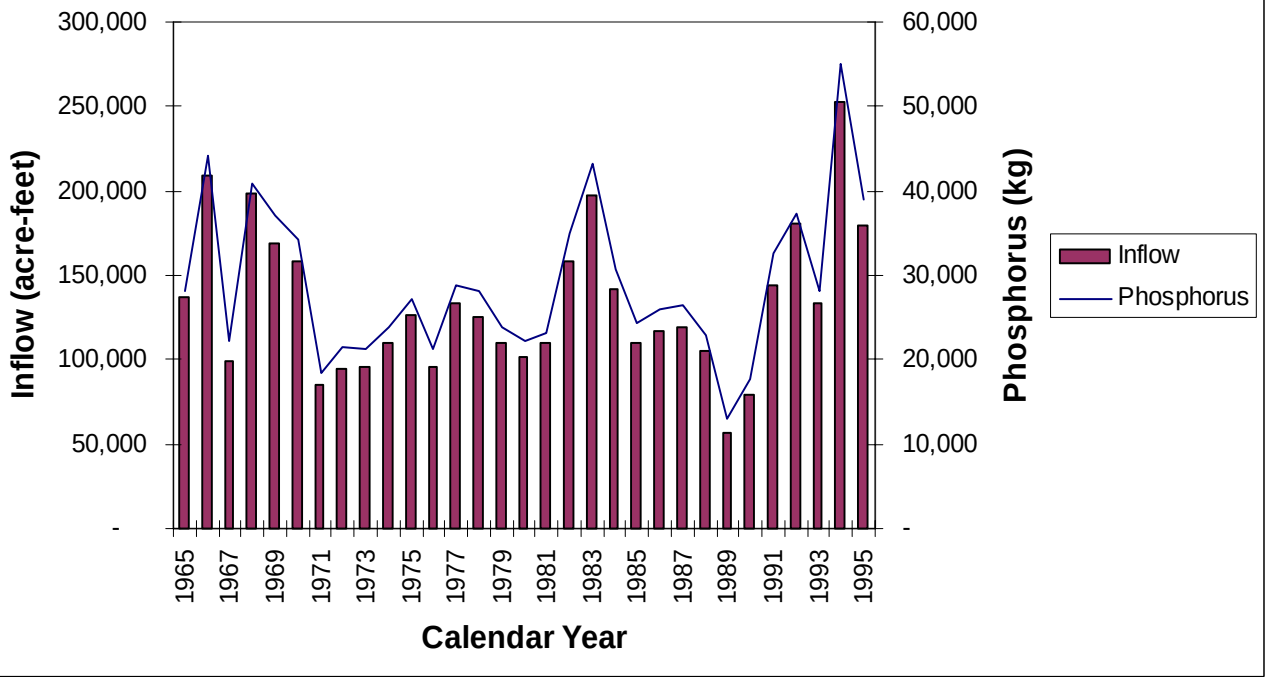
A schematic of STA-1 East is presented in Figure 4-4.



Tributary Basin Map - STA 1 East
Figure 4-1

ERRD/ESP CMIESSAU 20-JAN-2000 ecp-sta1e.apr ecp-sta1e-L

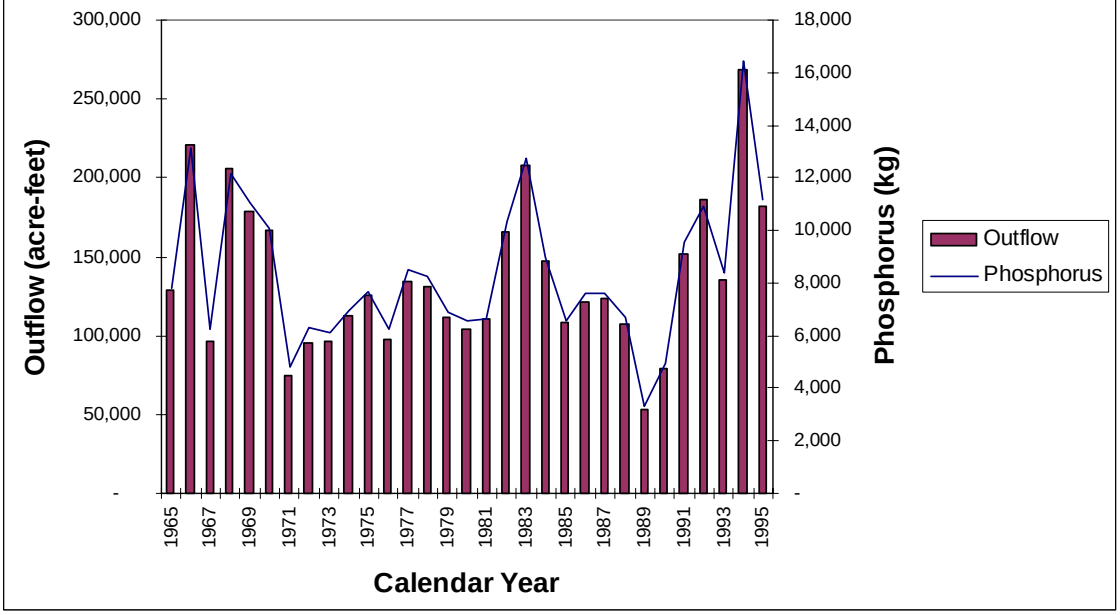
Figure 4-2. Summary of Baseline Flows and Phosphorus Loads - STA-1 East Inflows



Notes:

1. A phosphorus concentration of 185 ppb was applied to the runoff from the C-51 West basin (Burns & McDonnell, 1994) and to the runoff from the Rustic Ranches subdivision.
2. A variable phosphorus concentration was applied to the runoff at S-5A/G-250, based on the daily regression analysis.
   For the S-5A basin dry season, the standard error of the estimate was 61.5 ppb, and for the wet season, the standard error of the estimate was 39.6 ppb.
3. A phosphorus concentration of 140 ppb was applied to the Lake releases, equal to the mean of the last ten years.

Figure 4-3. Summary of Baseline Flows and Phosphorus Loads - STA-1 East Outflows



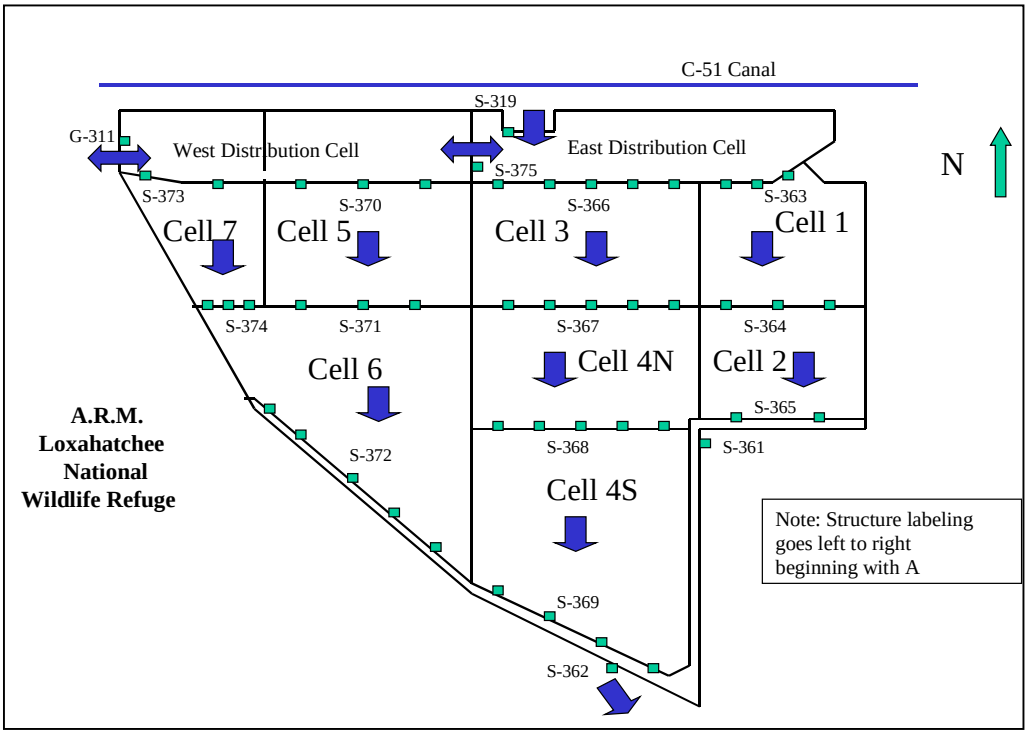


Figure 4-4. Schematic of STA 1 East (not to scale).

Alternative 1 – Integrate with C-51 and Southern L-8 Reservoir CERP Project (2014 completion)

Description:
For this alternative, it is assumed that there will be a diversion of a portion of the C-51W Basin runoff, that would have gone to STA-1E, to the C-51 and Southern L-8 Reservoir. It is assumed that there will be no retrofits to STA-1E for this alternative. Reduced flows and phosphorus loads to STA-1E will result in lower phosphorus levels to the Refuge.

Influence on Flow:
A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Diversion to CERP Project:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline flows. As part of the CERP project, a portion of the C-51W Basin runoff will be diverted from the C-51 Canal and away from the STA-1 East project. The Baseline flows will be reduced by the amount of the diversion.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the phosphorus load associated with the C-51 West basin runoff going into STA-1E, as contained in the Baseline data set, will be reduced by 5%, 10%, 15% 20% and 25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. **Diversion to CERP Project:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline loads. As part of the diversion of water from STA-1E to the CERP project, phosphorus loads contained in the portion of C-51W Basin runoff will be diverted away from the STA-1 East project. Consequently, STA-1E outflow loads will be lower as a result of the lower TP inflow loads in this alternative. The Baseline loads will be reduced by the amount of the diversion.

Costs:
Diversion to CERP Project: It is assumed that all costs associated with the diversion are included in the CERP project costs, and therefore this alternative would have no additional cost.

Alternative 2 – Optimize Performance of STA-1 East Within the Existing Footprint (12/31/2006 completion)

Description:
Basin-scale Treatment: This alternative includes retrofitting STA-1E to establish a composite biological treatment system within the footprint. This composite system would generally consist of 25% emergent vegetation, 50% submerged aquatic vegetation (SAV) and 25% PSTA. The partitioning for this alternative will be based on current Corps of Engineers plans for vegetation within STA-1E. This alternative may require the addition of 1-2 additional levees and 8-10 water control structures to achieve the 25/50/25% partition. There may be some loss of capacity in meeting PSTA hydraulic constraints, and therefore in order to avoid bypass, may have to build higher levees to hold water in upstream cells at higher stages. Based on preliminary PSTA research results, this alternative may require the addition of 0.5-2.0 feet of limerock for the PSTA cells.

Influence on Flow:
A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Basin-scale Treatment:** Prior to the CERP project coming on line, the inflows to STA-1E should be same as the Baseline data set. After the CERP project comes on line, flows may be reduced due to diversion to the C-51 and Southern L-8 Reservoir.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the phosphorus load associated with the C-51 West basin runoff going into STA-1E, as contained in the Baseline data set, will be reduced by 5%, 10%, 15% 20% and 25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. Basin-scale Treatment: Prior to the CERP project coming on line, the composite biological system should have better nutrient removal performance than the original STA, hence the Baseline loads will be adjusted for this alternative. After the CERP project comes on line, the Baseline loads will be further reduced by the amount of the diversion.

Costs:
Basin-scale Treatment: Additional levees, additional structures, higher levees, installation of limerock, and additional O & M costs, etc., will be required in order to retrofit STA-1E for this alternative.

Alternative 3 – Expand STA-1E to Achieve Lowest Sustainable TP Concentration (12/31/2006 completion)

Description:

Basin-scale Treatment: This alternative includes expanding the STA-1E footprint as needed to achieve the planning level discharge target of 10 ppb phosphorus, or the lowest sustainable concentration from a composite (i.e., 25/50/25) biological system (within the calibrated range of the DMSTA model), whichever is higher. There may be some loss of capacity in meeting PSTA hydraulic constraints, and therefore in order to avoid bypass, may have to build higher levees to hold water in upstream cells at higher stages. Based on preliminary PSTA research results, this alternative may require the addition of 0.5-2.0 feet of limerock for the PSTA cells. Acquisition of additional lands will be required for this alternative, which will require acquisition of adjacent farms and/or homes.

Influence on Flow:

A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Basin-scale Treatment:** Prior to the C-51 and Southern L-8 Reservoir CERP project coming on line, there would be a reduction in inflows to the STA due to the reduced watershed resulting from expansion of the treatment area; hence the Baseline data set will be adjusted for this alternative. After the CERP project comes on line, inflows to STA-1E will be reduced further due to diversion to the C-51 and Southern L-8 Reservoir Project. The Baseline data set inflows will then be reduced by the amount of the diversion to the CERP project.

Influence on Water Quality:

A. **Source Control:** As part of the sensitivity analysis, the phosphorus load associated with the C-51 West basin runoff going into STA-1E, as contained in the Baseline data set, will be reduced by 5%, 10%, 15% 20% and 25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. Basin-scale Treatment: Prior to the CERP project coming on line, there would be a reduction in phosphorus loads to the STA due to the reduced watershed resulting from expansion of the treatment area and the composite biological system should have better nutrient removal performance than the original STA, hence the Baseline data set will be adjusted for this alternative. After the CERP project comes on line, phosphorus loads will be reduced further due to diversion to the C-51 and Southern L-8 Reservoir Project, and the Baseline loads will be reduced by the amount of the diversion.

Costs:

Basin-scale Treatment: Additional land, levees, additional structures, higher levees, installation of limerock, additional O & M costs, etc., will be required in order to expand STA-1E for this alternative.

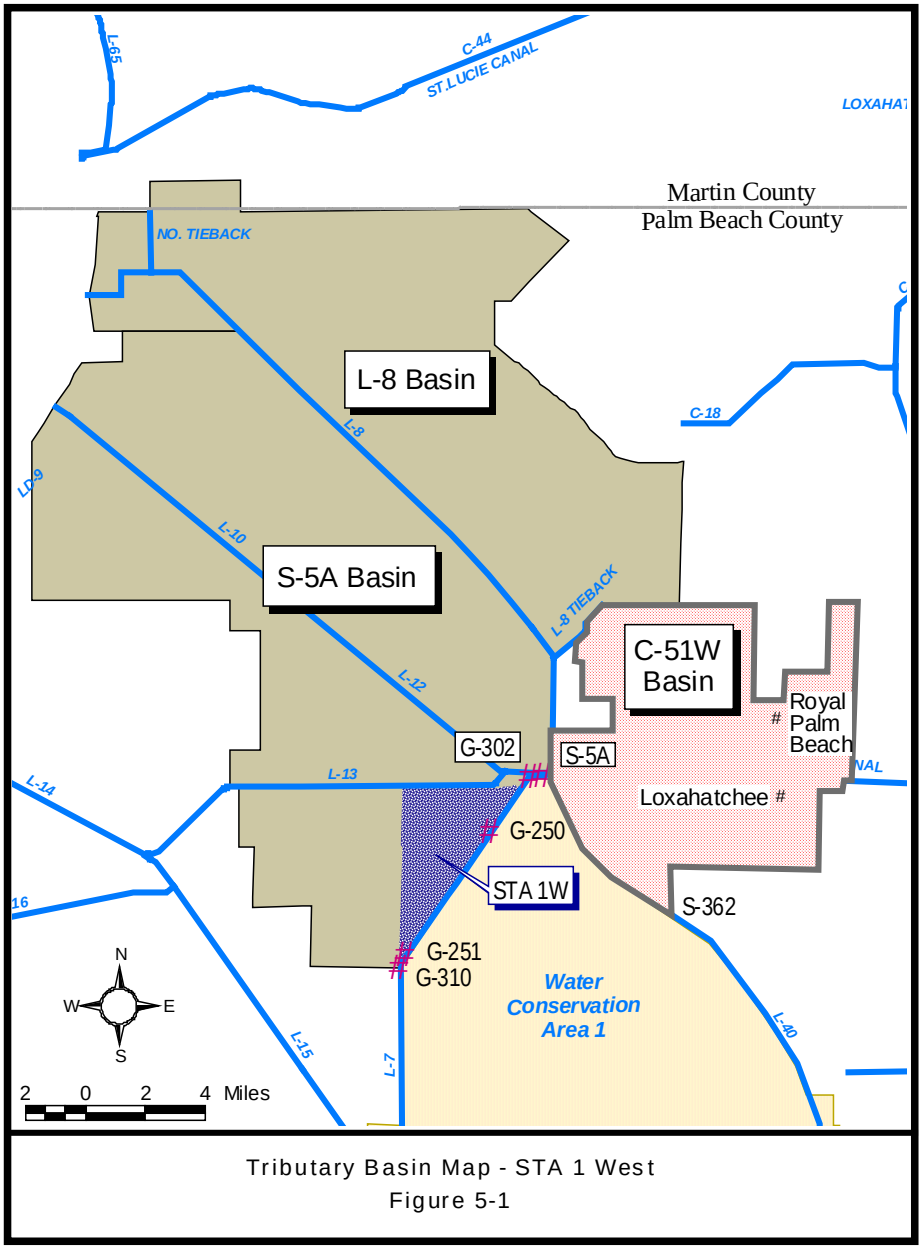
5.0 STA-1W PRELIMINARY ALTERNATIVE COMBINATIONS

The S-5A drainage basin is 194.3 square miles in area and is located in northwestern Palm Beach County. The project canals and water control structures in the S-5A Basin have four primary functions: (1) to remove excess water from the S-5A Basin to storage in Water Conservation Area 1 (WCA 1), and under some flood conditions, to storage in Lake Okeechobee; (2) to prevent over-drainage of the S-5A Basin; (3) to supply water from WCA 1, Lake Okeechobee, or the L-8 Basin to the S-5A Basin for irrigation; and (4) to provide conveyance for regulatory releases from Lake Okeechobee to WCA 1 and for water supply releases from the Lake to the C-51 Basin for municipal and agricultural use and to maintain the optimum canal water level to prevent saltwater intrusion. There are two project canals in the S-5A Basin: the L-10/L-12 and L-13 borrow canals. There are six project structures regulating flow in the S-5A Basin: S-5A, S-5AE, S-5AS, S-5AW, S-5AX, and S-352.

The basins tributary to STA-1 West are presented in Figure 5-1. STA-1 West will treat stormwater flows from the S-5A Basin, the East Beach Water Control District, the C-51 West Basin and at times the L-8 Canal Basin, as well as Lake Okeechobee releases during periods of high lake stages (if available treatment capacity exists in the treatment area).

Note: The Baseline Flows and Phosphorus Loads shown in Figures 5-5 and 5-6 are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. For the water quality component, a regression relationship was developed between flow and phosphorus concentration. The resulting regression equation was applied to the simulated flows to create the 31-year period of Baseline flow and water quality data. Reference: Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001.

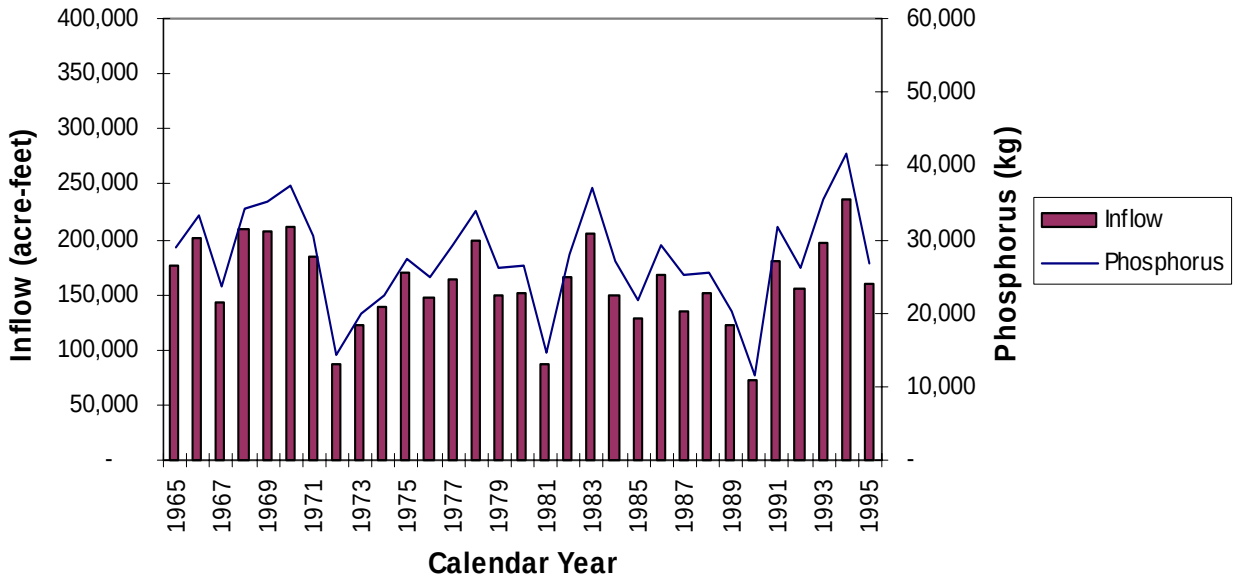
A schematic of STA-1 West is presented in Figure 5-7.



Tributary Basin Map - STA 1 West
Figure 5-1

ERRD/ESP CMIESSAU REV. 21-JAN-2000 ecp-sta1w.apr ecp-sta1w-L

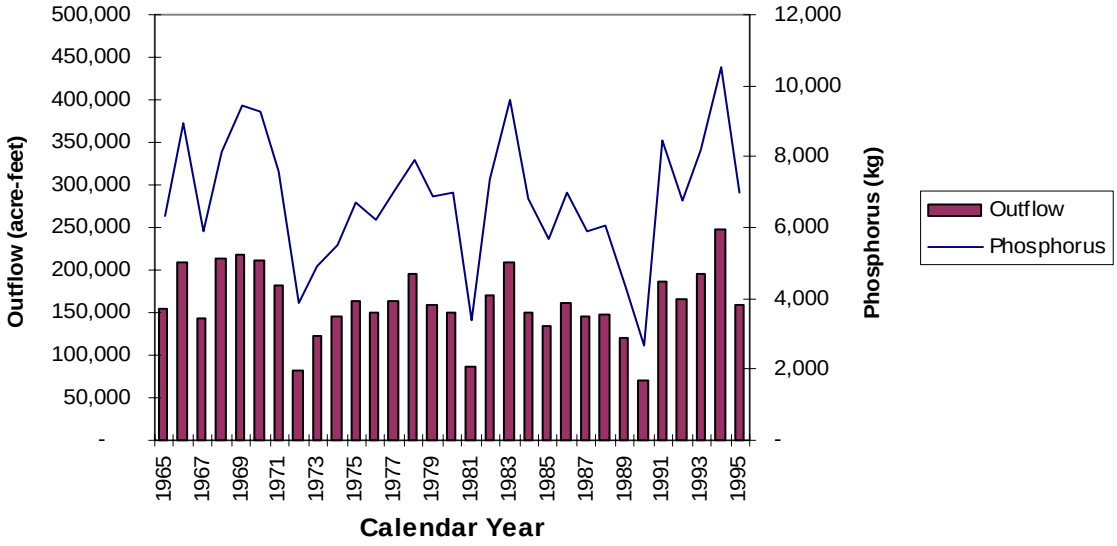
Figure 5-5. Summary of Baseline Flows and Phosphorus Loads - STA-1 West Inflows



Notes:

1. A phosphorus concentration of 140 ppb was applied to the Lake releases, equal to the mean of the last ten years.
2. A variable phosphorus concentration was applied to the runoff at S-5A/G-250, based on the daily regression analysis. For the S-5A basin dry season, the standard error of the estimate was 61.5 ppb, and for the wet season, the standard error of the estimate was 39.6 ppb.

Figure 5-6. Summary of Baseline Flows and Phosphorus Loads - STA-1 West Outflows



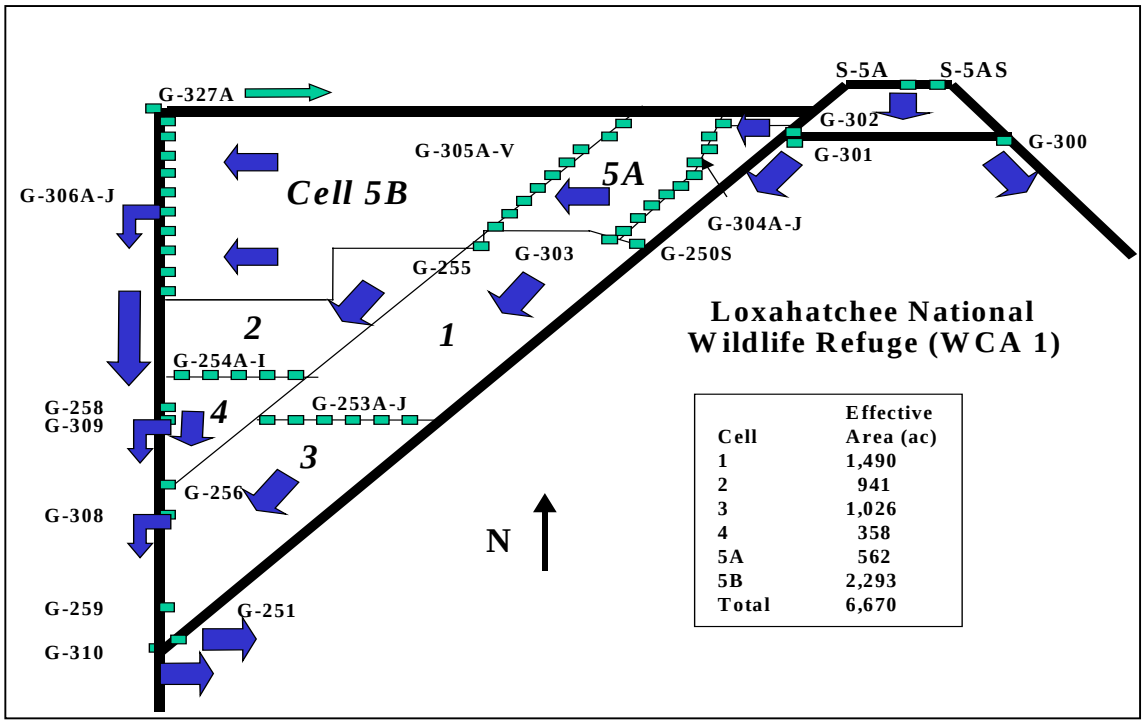


Figure 5-7. Schematic of STA-1 West (not to scale).

Alternative 1 – Integrate with C-51 and Southern L-8 Reservoir CERP Project - STA-1E Flows and Loads Diverted Away from STA-1W (2014 completion)

Description:

Integrate with CERP Project: A portion of the C-51W Basin runoff will be diverted away from STA-1E and to the C-51 and Southern L-8 Basin Reservoir. This should negate the need to transfer about 11,500 acre-feet per year from STA-1E to STA-1W. With this expected reduction in inflow (and associated loads), STA-1W will perform better than the Baseline condition. It is assumed that there will be no retrofits to STA-1W for this alternative.

Influence on Flow:

A. Source Control: It is assumed that there will be no change in the Baseline flows associated with source controls.

B. Integrate with CERP Project: Before the CERP project become operational, there will be no revision of the Baseline flows. After the CERP project becomes operational, it is assumed that approximately 11,500 acre feet per year of C-51W Basin runoff, that would have otherwise gone to STA-1W, will be diverted away from STA-1W to the CERP project.

Influence on Water Quality:

A. Source Control: As part of the sensitivity analysis, the daily phosphorus loads associated with the EAA basin runoff going into the treatment area, as contained in the Baseline data set, will be varied over the range –25% to +25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.

B. Integrate with CERP Project: Prior to the CERP projects becoming operational, there will be no revision of the Baseline loads. After the CERP project becomes operational, STA-1W should have lower outflow loads due to lower inflow loads.

Costs:

Integrate with CERP Project: There will be no additional costs associated with this component.

Alternative 2 – Optimize Performance of STA-1 West Within Existing Footprint (12/31/2006 completion)

Description:

A. Source Control: It is assumed that the 50% load reduction for the EAA basins reflected in the Baseline data set will be maintained.

B. Basin-scale Treatment: This alternative includes establishing a composite biological treatment system within the existing footprint to achieve a 25/50/25% split for emergent/SAV/PSTA, in consideration of existing levee locations, with possible addition of levees and water control structures (to be refined better during the evaluation process). There may be some loss of capacity in meeting PSTA hydraulic constraints, and therefore in order to avoid bypass, may have to build higher levees to hold water in upstream cells at higher stages. Based on preliminary PSTA research results, this alternative may require the addition of 0.5-2.0 feet of limerock for the PSTA cells.

Influence on Flow:

A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.

B. **Basin-scale Treatment:** Prior to the CERP project becoming operational, there will be no revision of the Baseline flows. After the CERP project becomes operational, STA-1W should perform better due to lower inflows and loads (diversion of C-51W Basin runoff to the CERP projects.) The Baseline flows will then be reduced by the amount of the diversion.

Influence on Water Quality:

A. Source Control: As part of the sensitivity analysis, the daily phosphorus loads associated with the EAA basin runoff going into the treatment area, as contained in the Baseline data set, will be varied over the range –25% to +25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.

B. Basin-scale Treatment: Prior to the CERP project coming on line, the composite biological system should have better nutrient removal performance than the original STA, hence the Baseline loads will be adjusted for this alternative. After the CERP project comes on line, the Baseline loads will be further reduced by the amount of the diversion.

Costs:

Basin-scale Treatment: Additional levees, additional structures, higher levees, installation of limerock, and additional O & M costs, etc., will be required in order to retrofit STA-1W for this alternative.

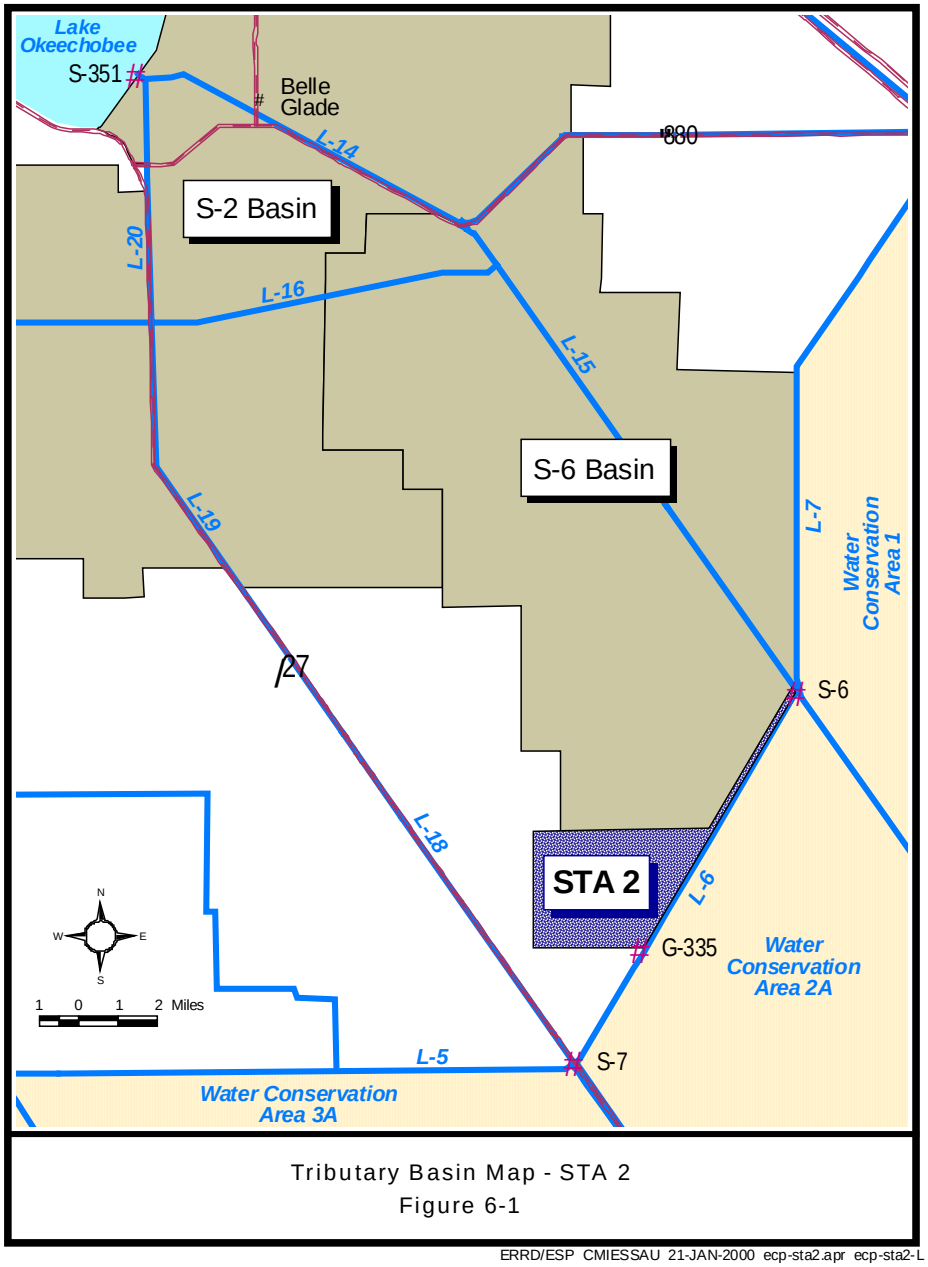
6.0 STA-2 PRELIMINARY ALTERNATIVE COMBINATIONS

The S-6 drainage basin is 132.8 square miles in area and is located in central Palm Beach County. The project canals and water control structures in the S-6 Basin have four primary functions: (1) to remove excess water from the S-6 Basin to storage in Water Conservation Area 1 (WCA 1); (2) to prevent over-drainage of the S-6 Basin; (3) to supply water from Lake Okeechobee to the S-6 Basin as needed for irrigation; and (4) to provide conveyance for regulatory releases from Lake Okeechobee to be passed to storage in WCA 1 and for water supply releases to be passed to eastern Palm Beach and Broward counties. There are two project canals in the S-6 Basin: the Hillsboro Canal and the L-6 borrow canal. Two other, non-project, canals are important in this basin. These are the Cross Canal and the Bolles Canal. The Cross Canal, the Bolles Canal, and the L-6 borrow canal are tributary to the Hillsboro Canal. There are four project structures affecting flows in the S-6 Basin: S-2, S-5AX, S-6, and S-351.

The basins tributary to STA-2 are presented in Figure 6-1. STA-2 will treat stormwater flows from the Hillsboro Canal Basin (S-6 Basin), the S-5A Basin, runoff from the Closter Farms, and East Shore Water Control District. In addition, S-6 will bypass Lake Okeechobee releases for downstream water supply and STA-2 will treat Lake releases during periods of high Lake stages (if available treatment capacity exists in the treatment area).

Note: The Baseline Flows and Phosphorus Loads shown in Figures 6-5 and 6-6 are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. For the water quality component, a regression relationship was developed between flow and phosphorus concentration. The resulting regression equation was applied to the simulated flows to create the 31-year period of Baseline flow and water quality data. Reference: Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001.

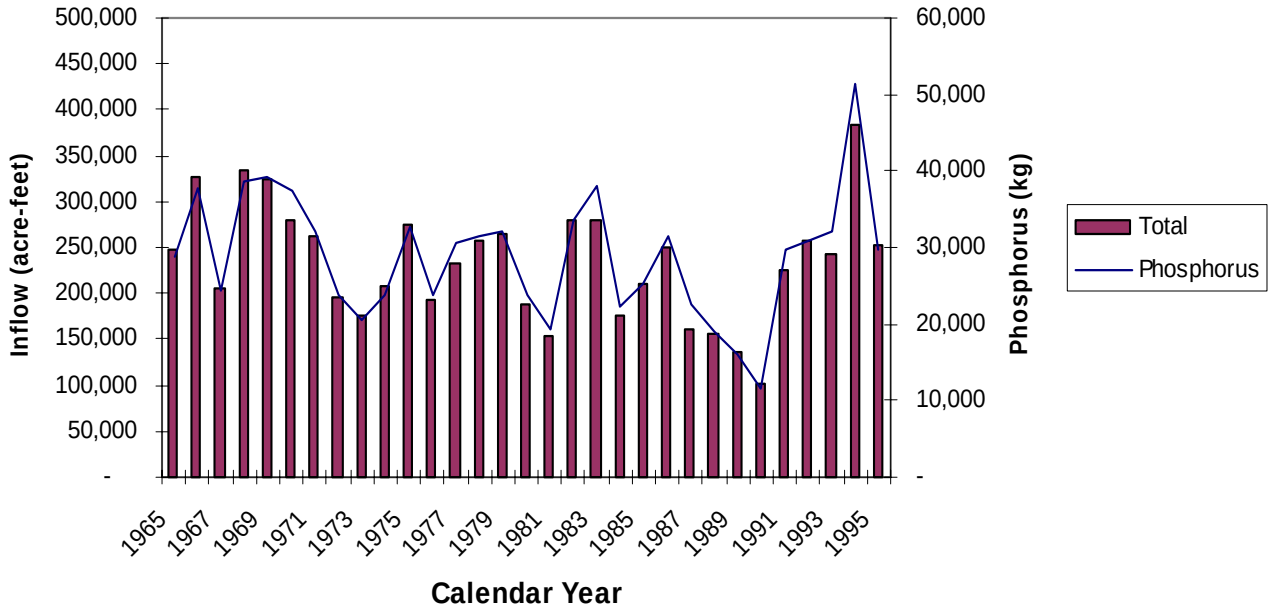
A schematic of STA-2 is presented in Figure 6-7.



Tributary Basin Map - STA 2
Figure 6-1

ERRD/ESP CMIESSAU 21-JAN-2000 ecp-sta2.apr ecp-sta2-L

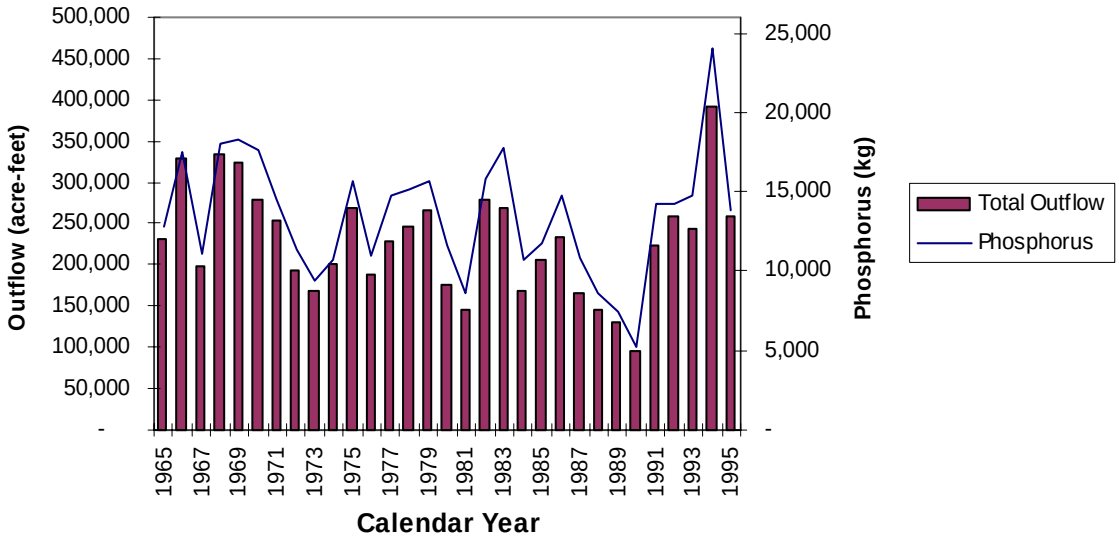
Figure 6-5. Summary of Baseline Flows and Phosphorus Loads - STA-2 Inflows



Notes:

1. A variable phosphorus concentration was applied to the runoff from the S-5A basin, based on the daily regression analysis. For the dry season, the standard error of the estimate was 61.5 ppb, and for the wet season, the standard error of the estimate was 39.6 ppb.
2. A variable phosphorus concentration was applied to the runoff from the S-6 basin, based on the daily regression analysis. For the dry season, the standard error of the estimate was 36.2 ppb; for the wet season, the standard error was 31.1 ppb.
3. A phosphorus concentration of 206 ppb was applied to the Ch. 298 District's runoff (Burns & McDonnell, 1994).
4. A phosphorus concentration of 74 ppb was applied to the Lake releases, equal to the mean of the last ten years.

Figure 6-6. Summary of Baseline Flows and Phosphorus Loads - STA-2 Outflows



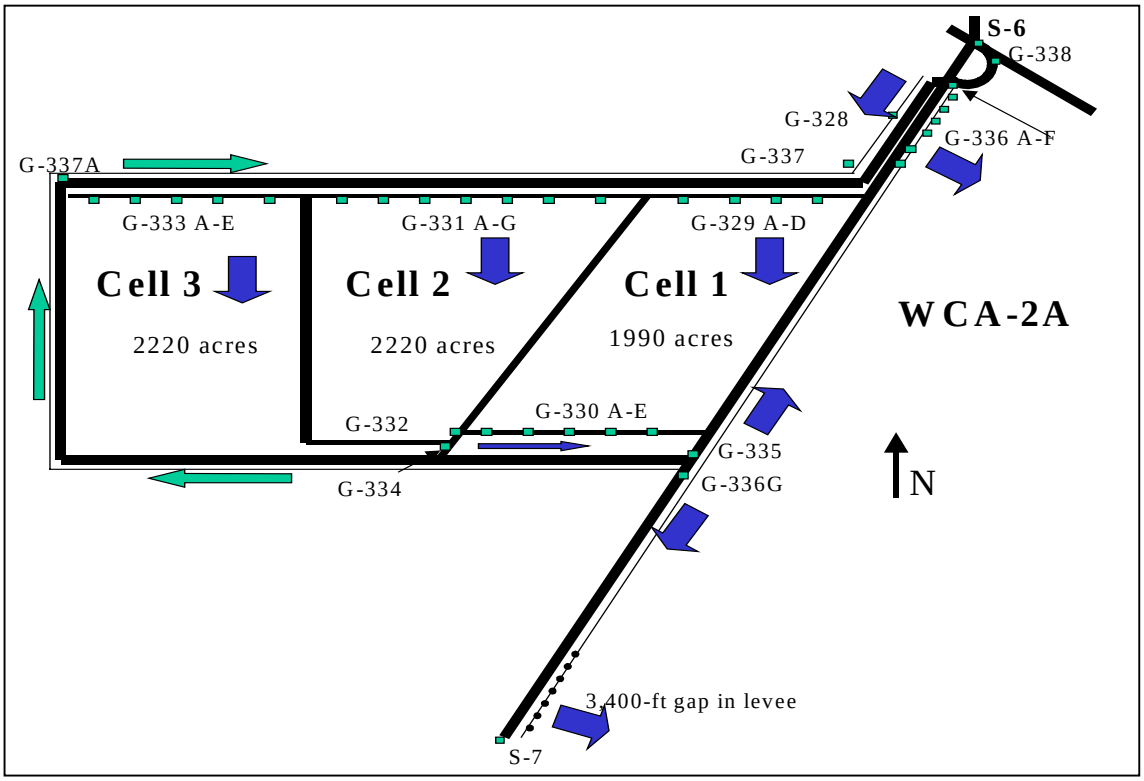


Figure 6-7. Schematic of STA-2 (not to scale).

Alternative 1 – Integrate with the EAA Storage Reservoirs CERP Project (2009 completion)

Description:
Integrate with CERP Project: After the EAA Storage Reservoirs Project becomes operational, there may be an opportunity for exchange of water between STA-2 and the Eastern reservoir. This exchange may improve the performance of STA-2 compared to the Baseline condition.

Influence on Flow:
A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Integrate with CERP Project:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline flows. After the EAA Storage Reservoirs Project becomes operational, there may be an opportunity for exchange of water between STA-2 and the Eastern reservoir.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the daily phosphorus loads associated with the EAA basin runoff going into the treatment area, as contained in the Baseline data set, will be varied over the range –25% to +25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. **Integrate with CERP Project:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline loads. If there is an exchange of water between STA-2 and the Eastern reservoir, this exchange may improve the performance of STA-2 compared to the Baseline condition.

Costs:
Integrate with CERP Project: There may be additional costs associated with this component to connect with the Eastern reservoir; there may also be savings in the STA-2 operations expenses due to reduced seepage control.

Alternative 2 – Optimize Performance of STA-2 Within Existing Footprint (12/31/2006 completion)

Description:
Basin-scale Treatment: This alternative includes establishing a composite biological treatment system within the existing footprint to achieve a 25/50/25% split for emergent/SAV/PSTA, in consideration of existing levee locations, with possible addition of levees and water control structures (to be refined better during the evaluation process). There may be some loss of capacity in meeting PSTA hydraulic constraints, and therefore in order to avoid bypass, may have to build higher levees to hold water in upstream cells at higher stages. Based on preliminary PSTA research results, this alternative may require the addition of 0.5-2.0 feet of limerock for the PSTA cells. The EAA Storage Reservoirs Project will provide some **operational** benefits in 2009.

Influence on Flow:
A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Basin-scale Treatment:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline flows. After the CERP project become operational, there may be an adjustment of flows resulting from the EAA Storage Reservoirs Project.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the daily phosphorus loads associated with the EAA basin runoff going into the treatment area, as contained in the Baseline data set, will be varied over the range –25% to +25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. **Basin-scale Treatment:** Prior to the CERP project coming on line, the composite biological system should have better nutrient removal performance than the original STA, hence the Baseline loads will be adjusted for this alternative. If there is an exchange of water between STA-2 and the Eastern reservoir, this exchange may improve the performance of STA-2 compared to the Baseline condition.

Costs:
Basin-scale Treatment: Additional levees, additional structures, higher levees, installation of limerock, and additional O & M costs, etc., will be required in order to retrofit STA-2 for this alternative.

Alternative 3 – Construct a Chemical Treatment Facility Within the Footprint of STA-2 (12/31/2006 completion)

Description:
Basin-scale Treatment: This alternative includes constructing a chemical treatment facility within the footprint of STA-2 by 12/31/2006. This would require conversion of a portion of STA-2 into a flow equalization basin, and the use of a portion of the existing STA-2 footprint for land disposal of residuals. While the CTSS final report recommends approximately 500 acres for a buffer marsh to increase alkalinity, data from test cell research suggests this post-treatment marsh may raise phosphorus levels above 10 ppb, and should be replaced with another process. The CTSS final report also recommends a post-treatment settling basin for capture of solids overflow but does not give specific guidance; the Consultant will need to determine this. The EAA Storage Reservoirs Project will provide some **operational** benefits in 2009.

Influence on flows:
A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Basin-scale Treatment:** Prior to the CERP project becoming operational there will be no change in the Baseline flows. After the CERP project become operational, there may be an adjustment of flows resulting from the EAA Storage Reservoirs Project.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the daily phosphorus loads associated with the EAA basin runoff going into the treatment area, as contained in the Baseline data set, will be varied over the range –25% to +25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. **Basin-scale Treatment:** Prior to and after the CERP project becoming operational, the addition of a chemical treatment plant should reduce TP to 10 ppb.

Costs:
Basin-scale Treatment: This alternative will have additional costs due to the retrofit of STA-2 to include a flow equalization basin, chemical treatment facility, and land disposal of residuals, along with all the associated infrastructure.

7.0 STA-3/4 PRELIMINARY ALTERNATIVE COMBINATIONS

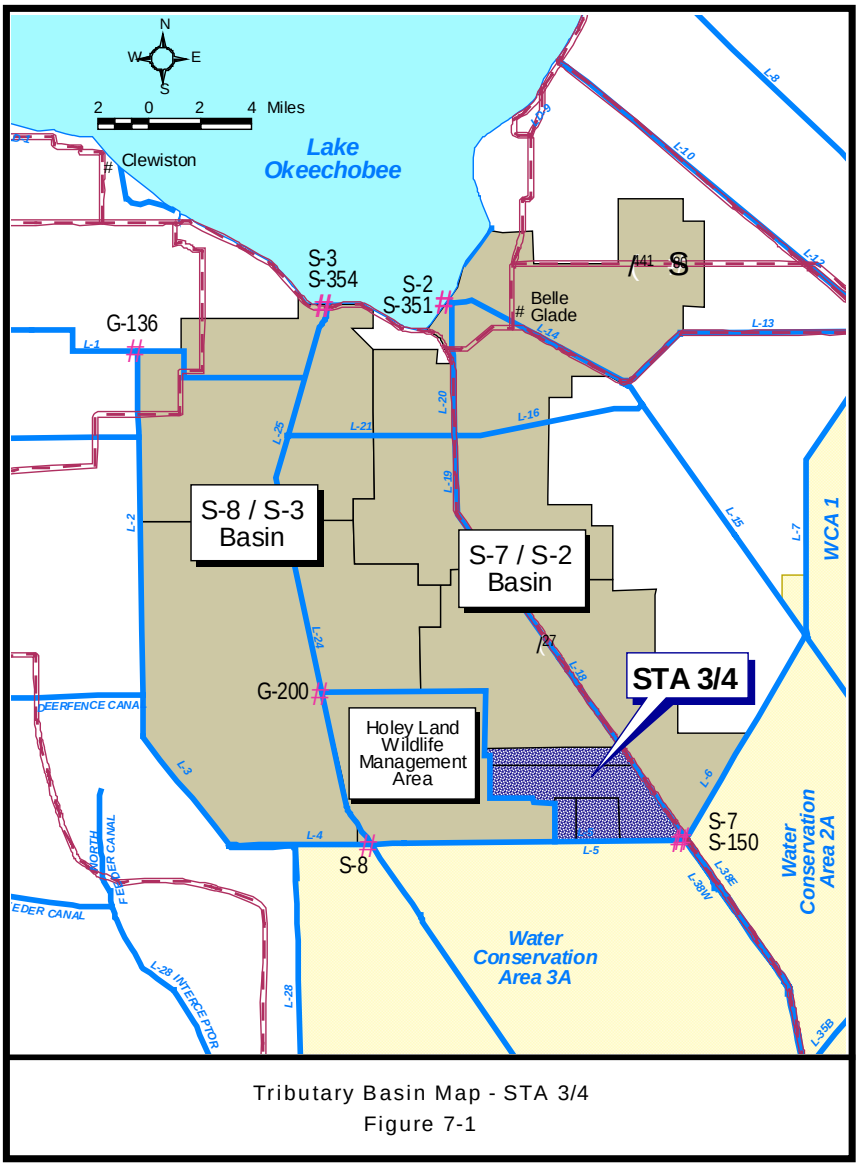
The S-7 drainage basin is 131.3 square miles in area and is located in south-central Palm Beach County. The project canals and water control structures in the S-7 Basin have four primary functions: (1) to remove excess water from the S-7 Basin to storage in Water Conservation Areas (WCAs) 2A and 3A; (2) to prevent over-drainage of the S-7 Basin; (3) to supply water from Lake Okeechobee to the S-7 Basin as needed for irrigation; and (4) to provide conveyance for regulatory releases from Lake Okeechobee to be passed to storage in WCAs 2A and 3A and for water supply releases to be passed to eastern Broward County. There are three project canals in the S-7 Basin: the North New River Canal, the L-6 borrow canal, and the L-5 borrow canal. There are four project structures affecting flow in the S-7 Basin: S-2, S-7, S-150, and S-351.

The S-8 drainage basin is 201.4 square miles in area and is located in southwestern Palm Beach County and in southeastern Hendry County. The project canals and water control structures in the S-8 Basin have five primary functions: (1) to remove excess water from the S-8 Basin to storage in Water Conservation Area 3A (WCA 3A); (2) to prevent over-drainage of the S-8 Basin; (3) to supply water from Lake Okeechobee to the S-8 Basin as needed for irrigation; (4) to provide conveyance for regulatory releases from Lake Okeechobee to storage in WCA 3A; and (5) to receive discharges of excess water from the L-3 borrow canal when these discharges will not cause flooding in the S-8 Basin. There are two project canals in the S-8 Basin: the Miami Canal and the L-4 borrow canal. There are four project structures affecting flow in the S-8 Basin: S-3, S-8, S-354, and G-88.

The basins tributary to STA-3/4 are presented in Figure 7-1. STA-3/4 will treat stormwater flows from the Miami Canal Basin, the North New River Canal Basin, as well as runoff from the South Shore Drainage District and South Florida Conservancy District. In addition, STA-3/4 will treat Lake Okeechobee regulatory releases if available treatment capacity exists in the treatment area.

Note: The Baseline Flows and Phosphorus Loads shown in Figures 7-8 and 7-9 are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. For the water quality component, a regression relationship was developed between flow and phosphorus concentration. The resulting regression equation was applied to the simulated flows to create the 31-year period of Baseline flow and water quality data. Reference: Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001.

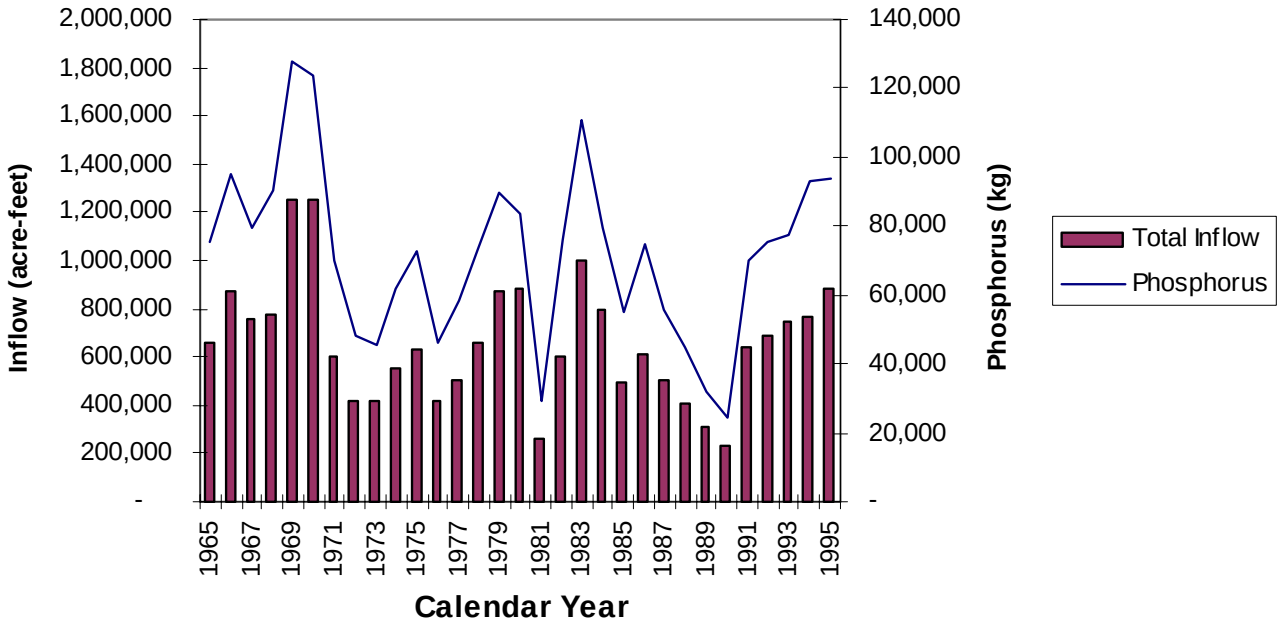
A schematic of STA-3/4 is presented in Figure 7-10.



Tributary Basin Map - STA 3/4
Figure 7-1

ERRD/ESP CMIESSAU REV. 04-JUN-2001 x:\ever-gis\ecp\aprfiles\ecp-sta3-4-cm1.apr ecp-sta3-4-L

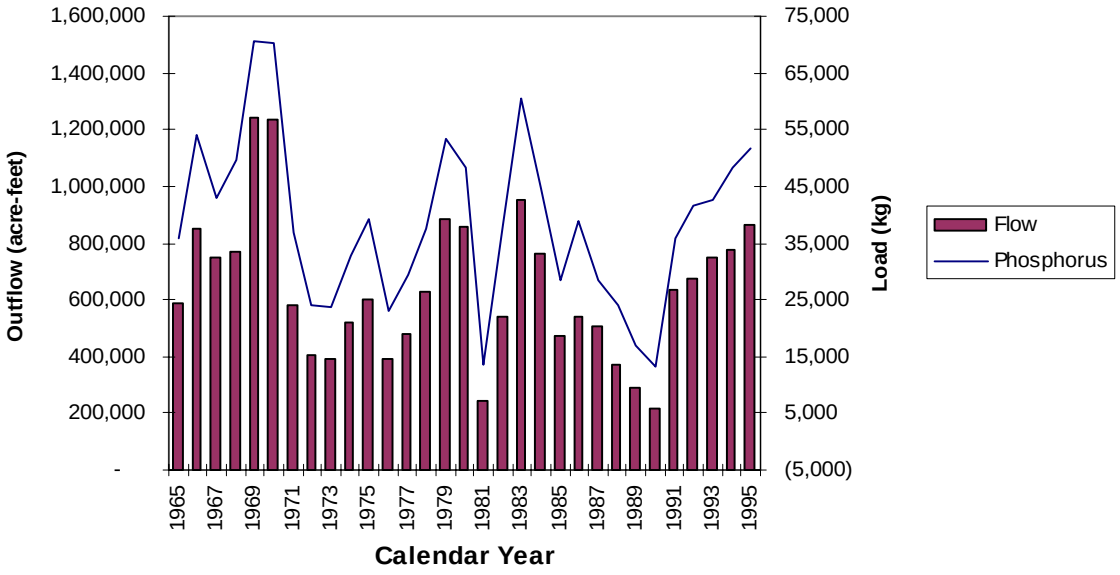
Figure 7-8. Summary of Baseline Flows and Phosphorus Loads - STA-3/4 Inflows



Notes:

1. A variable phosphorus concentration was applied to the runoff from the S-8 basin, based on the daily regression analysis. For the dry season, the standard error of the estimate was 28.0 ppb; for the wet season, the standard error was 42.6 ppb.
2. A variable phosphorus concentration was applied to the runoff from the S-7 basin, based on the daily regression analysis. For the dry season, the standard error of the estimate was 42.6 ppb; for the wet season, the standard error was 27.0 ppb.
3. The 90-99 flow-weighted mean phosphorus concentration of 67 ppb was applied to Miami Canal Lake releases.
4. The 90-99 flow-weighted mean phosphorus concentration of 71 ppb was applied to the N. New River Canal Lake releases.
5. A phosphorus concentration of 100 ppb was applied to the Ch. 298 District's runoff (Burns & McDonnell, 1994).
6. A phosphorus concentration of 136 ppb was applied to the S-236 basin runoff (Burns & McDonnell, 1994).
7. A variable phosphorus concentration was applied to the G-136 flows, based on the regression analysis. For the dry season, the standard error of the estimate was 60.6 ppb; for the wet season, the standard error was 70.9 ppb.

Figure 7-9. Summary of Baseline Flows and Phosphorus Loads - STA-3/4 Outflows



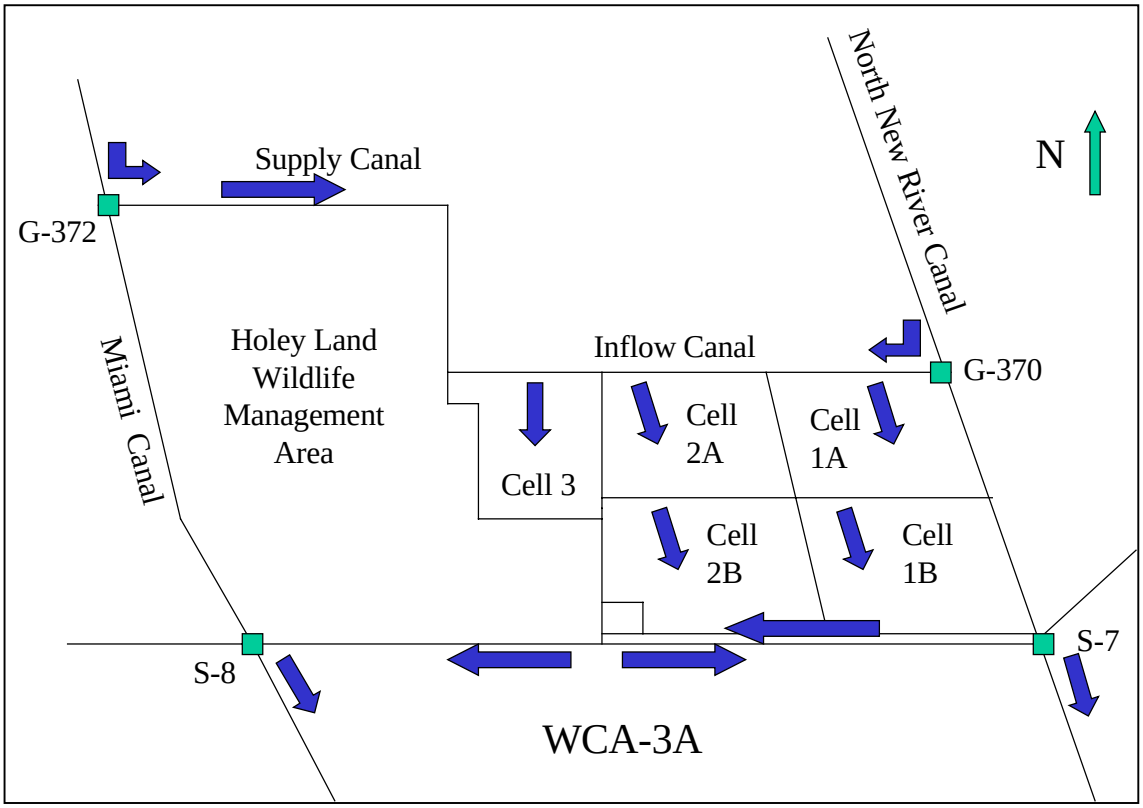


Figure 7-10. Schematic of STA-3/4 (not to scale).

Alternative 1 – Integrate with the EAA Storage Reservoirs CERP Project (2009 completion)

Description:
Integrate with CERP Project: It is assumed that there will be no retrofits to STA-3/4 for this alternative. After the EAA Storage Reservoirs Project becomes operational, with peak flow attenuation, some flow reduction, and associated reduction in loads, STA-3/4 will perform better than the Baseline condition.

Influence on Flow:
A. **Source Control**: It is assumed that there will be no change in the Baseline flows associated with source controls.
B. Integrate with CERP Project: Prior to the CERP projects becoming operational, there will be no revision of the Baseline flows. After the EAA Storage Reservoirs Project becomes operational, there will be peak flow attenuation and some flow reduction into STA-3/4. Other CERP projects, operational modifications to the Holey Land and Rotenberger Wildlife Management Areas and modifications to the G-404 pump station, may influence discharges from STA-3/4.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the daily phosphorus loads associated with the EAA basin runoff going into the treatment area, as contained in the Baseline data set, will be varied over the range –25% to +25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. **Integrate with CERP Project:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline loads. After the EAA Storage Reservoirs Project becomes operational, there will be load reduction into STA-3/4. In addition, STA-3/4 should perform better due to attenuation of peak flows resulting from operation of the EAA Storage Reservoirs Project.

Costs:
Integrate with CERP Project: It is assumed that there will be no additional costs associated with this component.

Alternative 2 – Optimize Performance of STA-3/4 Within Existing Footprint (12/31/2006 completion)

Description:
Basin-scale Treatment: This alternative includes establishing a composite biological treatment system within the existing footprint to achieve a 25/50/25% split for emergent/SAV/PSTA, in consideration of existing levee locations, with possible addition of levees and water control structures (to be refined better during the evaluation process). There may be some loss of capacity in meeting PSTA hydraulic constraints, and therefore in order to avoid bypass, may have to build higher levees to hold water in upstream cells at higher stages. Based on preliminary PSTA research results, this alternative may require the addition of 0.5-2.0 feet of limerock for the PSTA cells. The EAA Storage Reservoirs Project will provide some **operational** benefits in 2009.

Influence on Flow:
A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Basin-scale Treatment:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline flows. After the CERP projects become operational, STA-3/4 should perform better due to attenuation of peak flows and possibly less flows resulting from operation of the EAA Storage Reservoirs Project. Other CERP projects, operational modifications to the Holey Land and Rotenberger Wildlife Management Areas and modifications to the G-404 pump station, may influence discharges from STA-3/4.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the daily phosphorus loads associated with the EAA basin runoff going into the treatment area, as contained in the Baseline data set, will be varied over the range –25% to +25%, and the influence that these reductions have on the outflow phosphorus concentration will be noted.
B. **Basin-scale Treatment:** Prior to the CERP project coming on line, the composite biological system should have better nutrient removal performance than the original STA, hence, the Baseline loads will be reduced for this alternative. After the CERP project comes on line, the Baseline loads may be further reduced due to improved performance resulting from operation of the EAA Storage Reservoirs Project.

Costs:
Basin-scale Treatment: Additional levees, additional structures, higher levees, installation of limerock, and additional O & M costs, etc., will be required in order to retrofit STA-3/4 for this alternative.

STA-5 AND STA-6 PRELIMINARY ALTERNATIVE COMBINATIONS

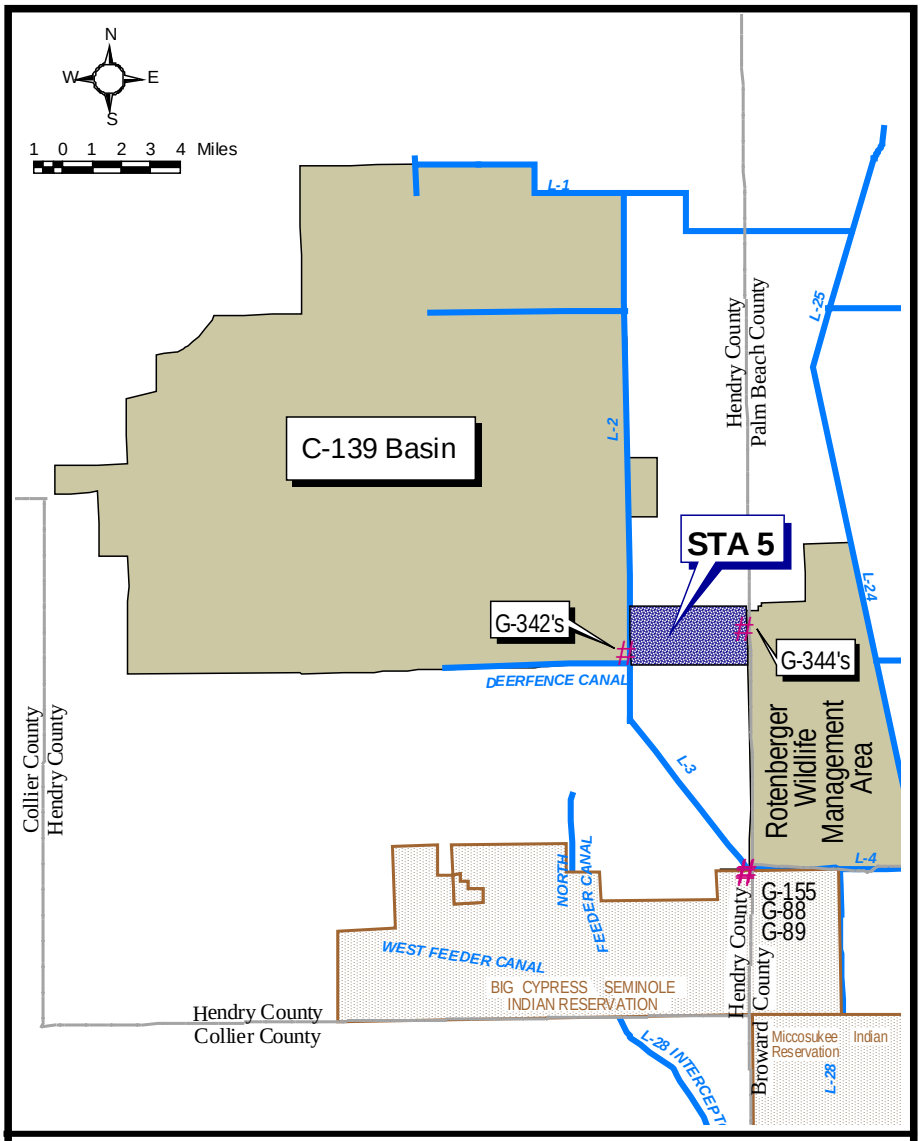
8.0 STA-5 (INCLUDING C-139 BASIN)

The C-139 Basin has an area of 168,437 acres and is located in Hendry County. The primary canals within the C-139 Basin are the L-1, L-2, and L-3 borrow canals. These canals were constructed in the 1950's primarily for fill material to construct the L-1, L-2, and L-3 levees. There are eight structures affecting flow in the C-139 Basin: G-150, G-151, G-152, G-135, G-136, G-88, G-89, and G-155. The majority of basin discharges south through the G-155, G-88 and G-89 structures. A portion of the basin discharges east through structure G-136 to the L-1 East Canal and on to the Miami Canal, where it flows south to S-8. The historic flows and loads for G-136 were included in the section on STA-3/4.

The basins tributary to STA-5 are presented in Figure 8-1. STA-5 will treat stormwater flows from the C-139 South Basin.

Note: The Baseline Flows and Phosphorus Loads shown in Figures 8-5 and 8-6 are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. For a complete description of the method used to develop the Baseline flow and water quality data set, refer to the report Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001.

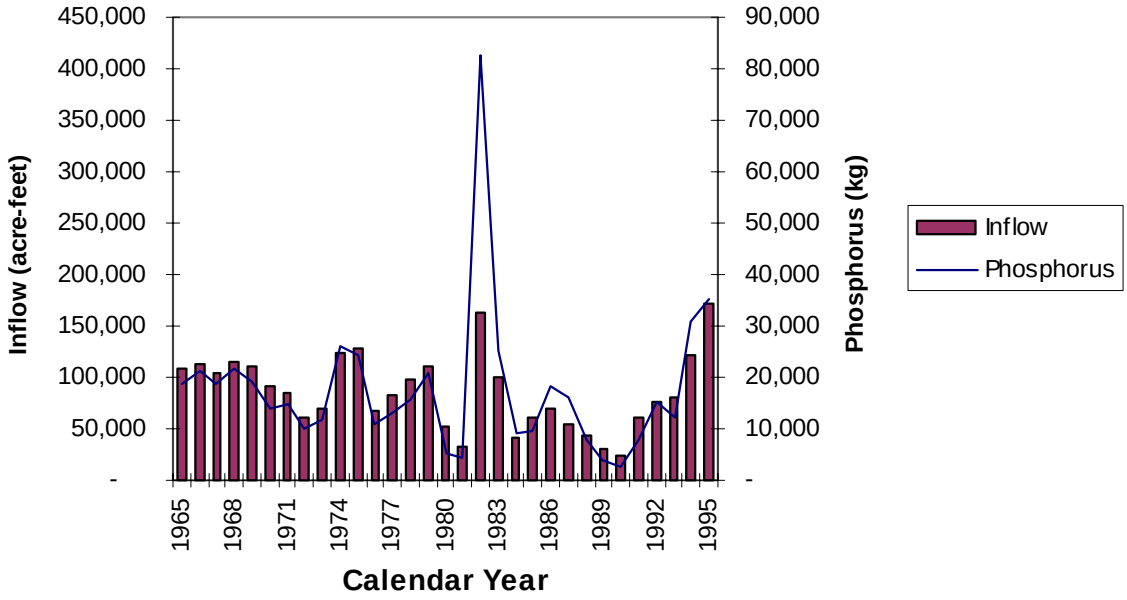
A schematic of STA-5 is presented in Figure 8-7.



Tributary Basin Map - STA 5
Figure 8-1

ERRD/ESP CMIESSAU 21-JAN-2000 ecp-sta5.apr ecp-sta5-L

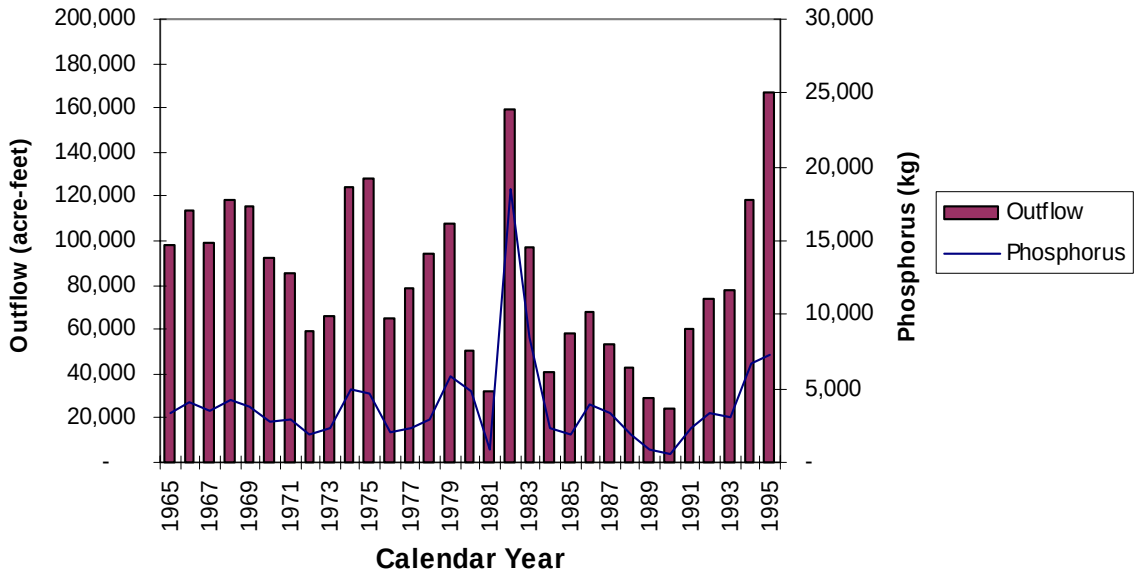
Figure 8-5. Summary of Baseline Flows and Phosphorus Loads - STA-5 Inflows



Notes:

1. A variable phosphorus concentration was applied to the C-139 basin runoff based on the daily regression analysis. For the dry season, the standard error of the estimate was 41.0 ppb; for the wet season, the standard error was 70.0 ppb.
2. The 1990-99 flow-weighted mean phosphorus concentration of 67 ppb was applied to Miami Canal Lake releases.

Figure 8-6. Summary of Baseline Flows and Phosphorus Loads - STA-5 Outflows



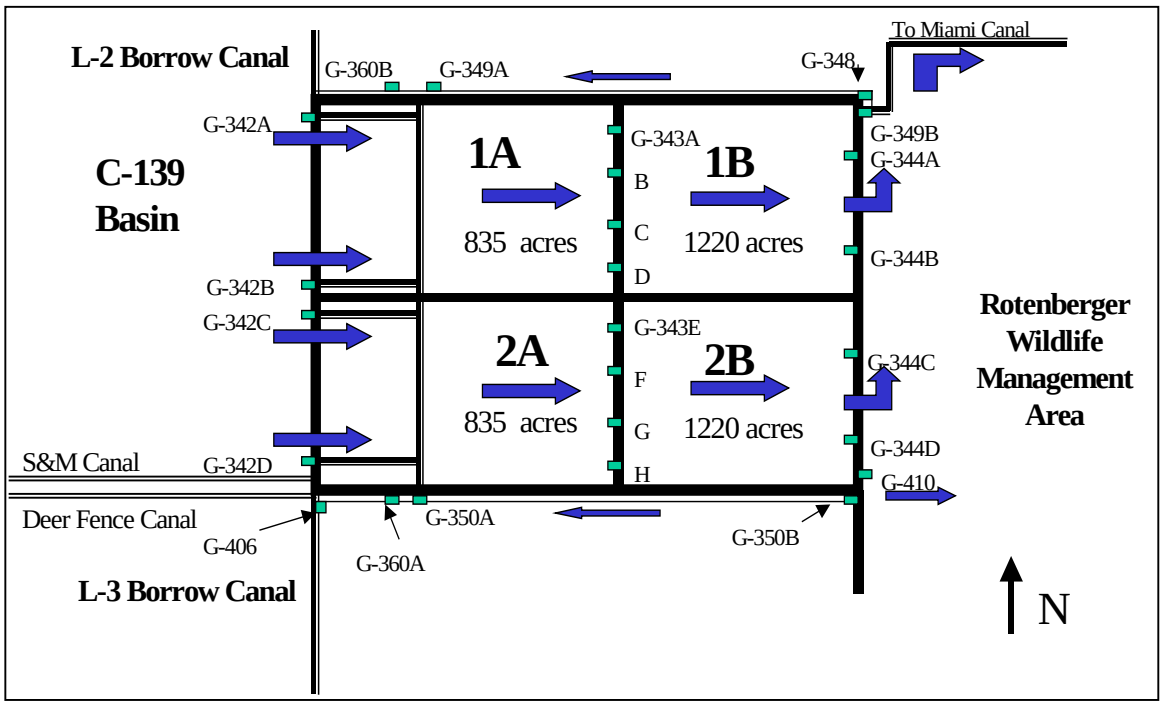


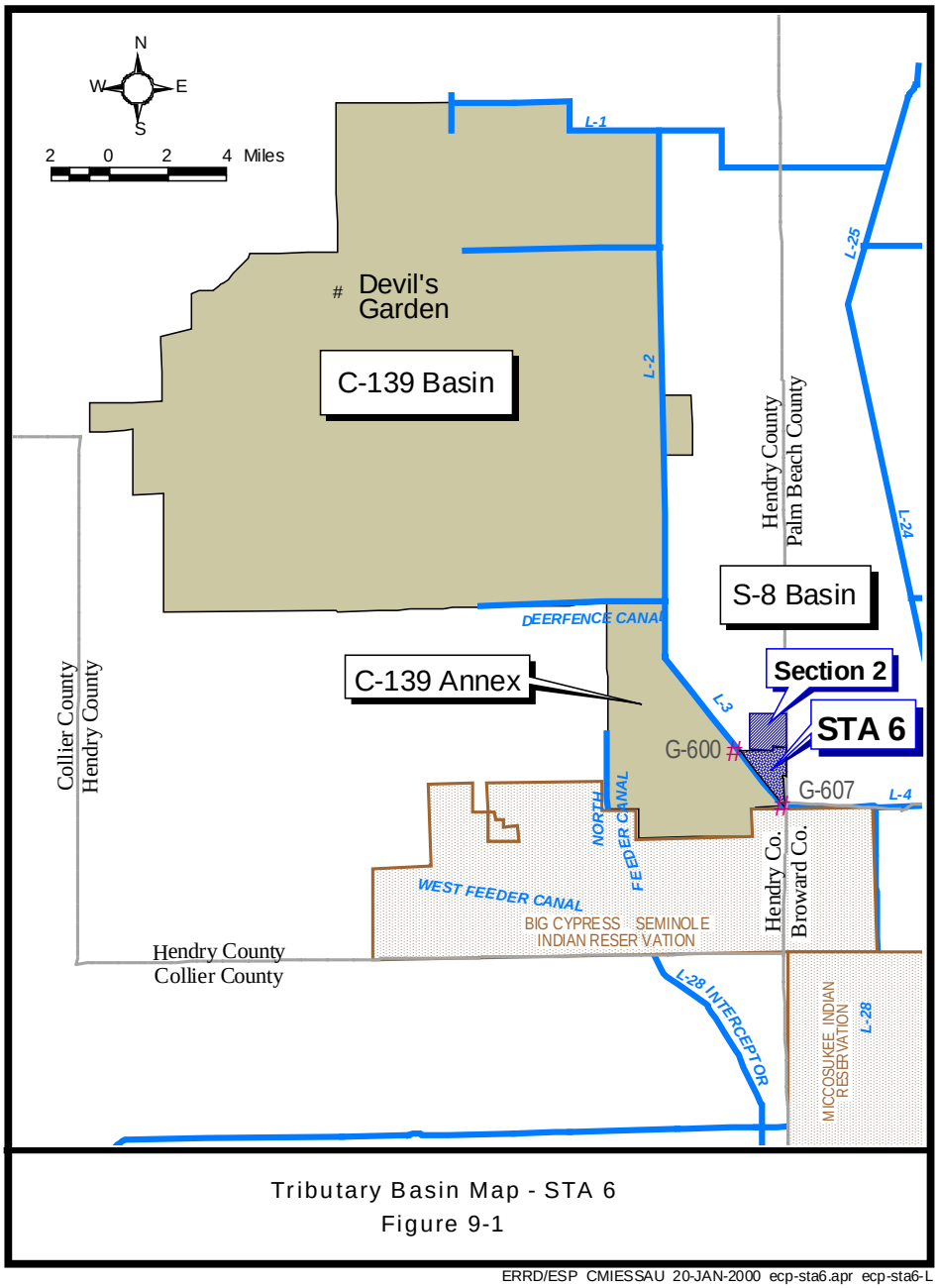
Figure 8-7. Schematic of STA-5 (not to scale).

9.0 STA-6

The basins tributary to STA-6 are presented in Figure 9-1. STA-6 Section 1 treats stormwater flows from approximately 10,000 acres north of the treatment area and south of STA-5 and west of the Rotenberger Wildlife Management Area. In the near future, STA-6 will be expanded to include approximately 1,400 additional acres for treatment of C-139 Basin and C-139 Annex flows.

Note: The Baseline Flows and Phosphorus Loads shown in Figures 9-5 and 9-6 are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. For a complete description of the method used to develop the Baseline flow and water quality data set, refer to the report Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001.

A schematic of STA-6 is presented in Figure 9-7.



Tributary Basin Map - STA 6
Figure 9-1

ERRD/ESP CMIESSAU 20-JAN-2000 ecp-sta6.apr ecp-sta6-L

Figure 9-5. Summary of Baseline Flows and Phosphorus Loads - STA-6 Inflows

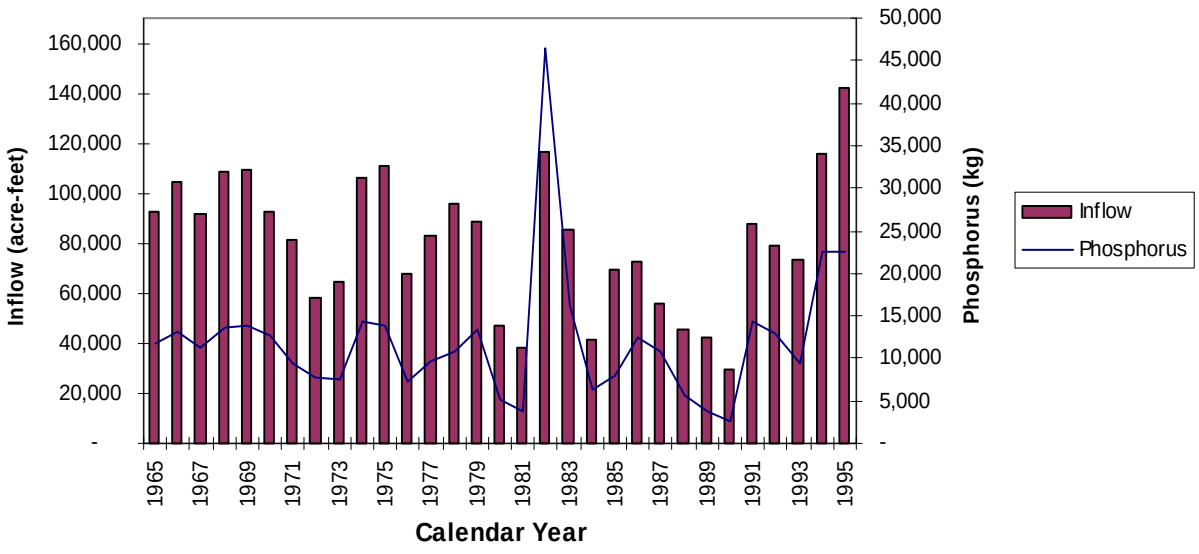
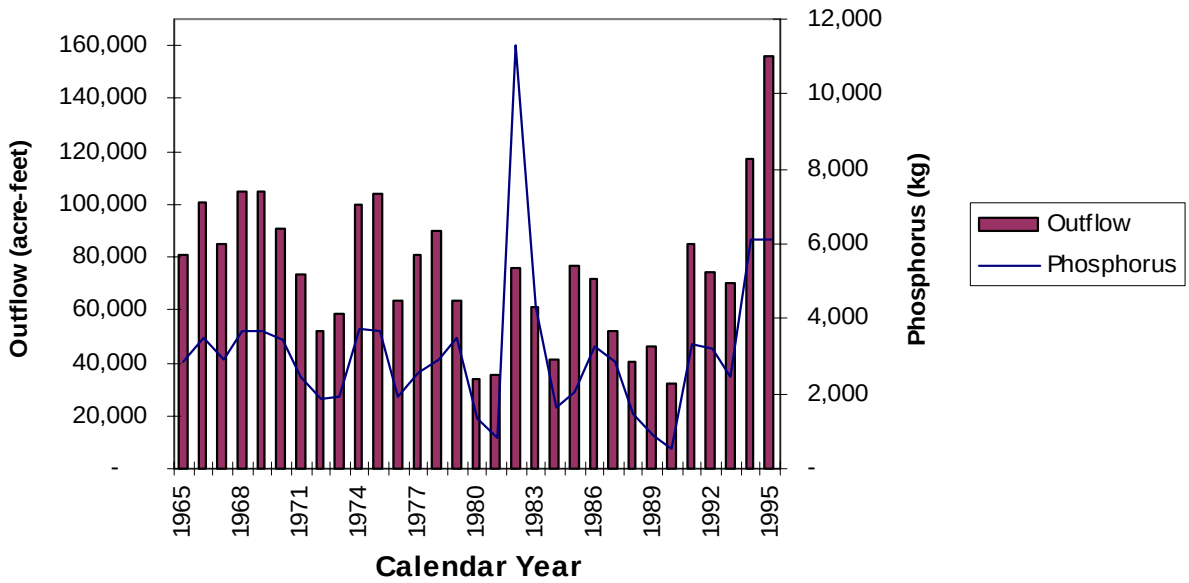


Figure 9-6. Summary of Baseline Flows and Phosphorus Loads - STA-6 Outflows



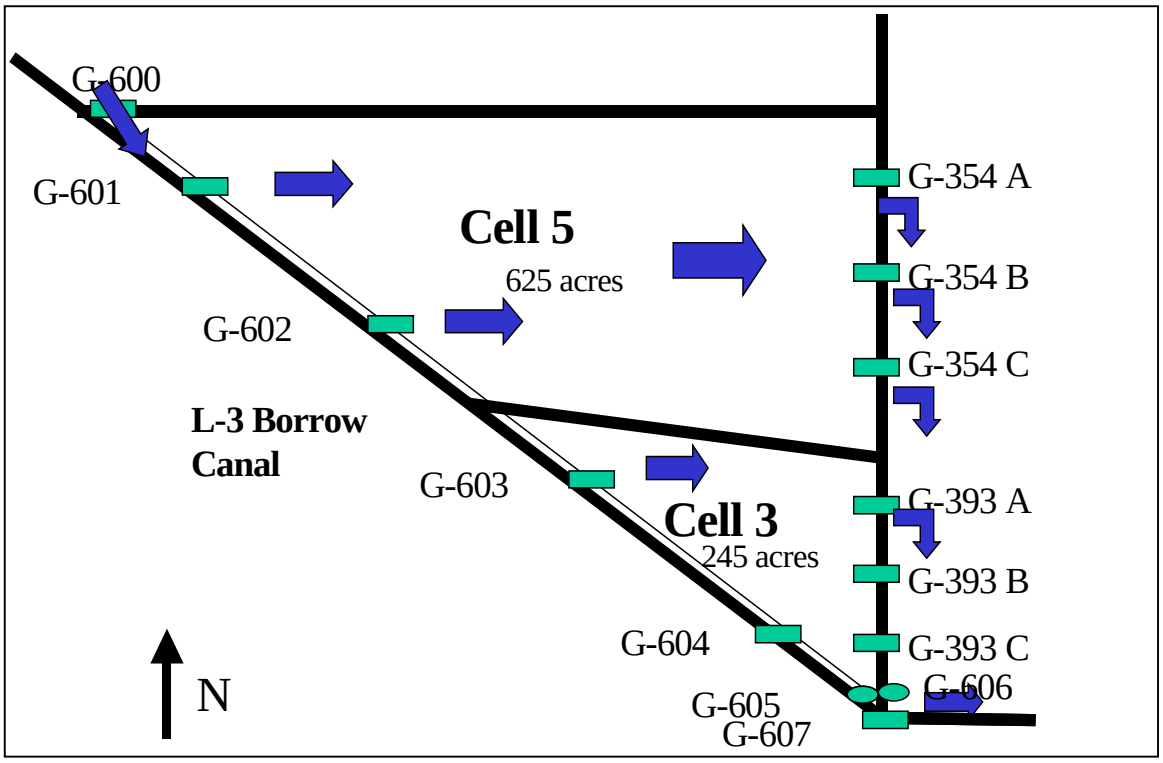


Figure 9-7. Schematic of STA-6 (not to scale).

Alternative 1. Integrate with the EAA Storage Reservoirs CERP Project (2009 completion)

Description:
Integrate with CERP Project: One portion of the EAA Storage Reservoirs Project is planned for the area between STA-5 and STA-6 by 2009. For the purposes of this feasibility study, it is assumed that this reservoir will capture all C-139 Basin and C-139 Annex runoff, then send it to STA-5 and STA-6 for final treatment. It is understood that this capture of C-139 basin runoff was not contemplated during the development of the 1999 Restudy, however, at that time there was no defined land acquisition associated with the project. Now that the area between STA-5 and STA-6 has been made available, it is prudent to consider integrating the reservoir with these treatment areas. This alternative will require some retrofits to STA-5 and STA-6 as needed to receive water from the reservoir. This alternative assumes that the entire current contributing watershed of STA-6 Section 1 (10,400 acres) will be converted to the reservoir, including the area originally contemplated for STA-6 Section 2.

Influence on Flow:
A. **Source Control**: It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Integrate with CERP Project:** Before the reservoir becomes operational, the STAs should receive the same flows as in the Baseline data set. After the reservoir becomes operational, flows may be altered significantly. The reservoir will capture all C-139 Basin and C-139 Annex runoff first, then send it to STA-5 and STA-6 for final treatment. Other CERP projects, operational modifications to the Holey Land and Rotenberger Wildlife Management Areas and modifications to the G-404 pump station, may influence discharges from STA-5.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the phosphorus load going into STA-5, as described in the Baseline data set, will be reduced by 5%, 10%, 15% 20% and 25%. Also, the daily phosphorus loads going into STA-6, as contained in the Baseline data set, will be varied over the range –25% to +25%.
B. **Integrate with CERP Project:** Prior to the CERP projects becoming operational, there will be no revision of the Baseline loads. After the EAA Storage Reservoirs Project comes on line, STA-5 and STA-6 should have better performance due to attenuation of peak flows through the reservoir, with associated load reductions.

Costs:
Integrate with CERP Project: This alternative assumes:
1. There should be no additional costs for the pump station for the C-139 Annex since it is included as part of the first phase of the ECP and it also should be offset by agricultural privilege tax revenues.
2. Retrofits of STA-5 and STA-6 to receive reservoir flows will be included as additional costs associated with this alternative.

Alternative 2 - Optimize Performance of STA-5 and STA-6 Within Existing Footprint, Including STA-6 Section 2 (12/31/2006 completion)

Description:

Basin-scale Treatment: This alternative includes establishing a composite biological treatment system within the existing footprints of STA-5 and STA-6 to achieve a 25/50/25% split for emergent/SAV/PSTA, in consideration of existing levee locations, with possible addition of levees and water control structures (to be better refined during the evaluation process). There may be some loss of capacity in meeting PSTA hydraulic constraints, and therefore in order to avoid bypass, may have to build higher levees to hold water in upstream cells at higher stages. Based on preliminary PSTA research results, this alternative may require the addition of 0.5-2.0 feet of limerock for the PSTA cells. The EAA Western Reservoir may provide some operational benefits beginning in 2009, which would require retrofits to the existing STAs to receive water from the reservoir. Construction of STA-6 Section 2 will be sized to the original 1470-acre footprint.

Influence on Flow:

A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Basin-scale Treatment:** Before the reservoir becomes operational, the STAs should receive the same flows as in the Baseline data set. After the reservoir becomes operational, flows may be altered significantly. Other CERP projects, operational modifications to the Holey Land and Rotenberger Wildlife Management Areas and modifications to the G-404 pump station, may influence discharges from STA-5.

Influence on Water Quality:

A. **Source Control:** As part of the sensitivity analysis, the phosphorus load going into STA-5, as described in the Baseline data set, will be reduced by 5%, 10%, 15% 20% and 25%. Also, the daily phosphorus loads going into STA-6, as contained in the Baseline data set, will be varied over the range –25% to +25%.
B. **Basin-scale Treatment:** Prior to the CERP project coming on line, the composite biological system should have better nutrient removal performance than the original STA, hence the Baseline loads will be reduced for this alternative. After the reservoir becomes operational, performance may improve even further, hence, the Baseline loads may be further reduced.

Costs:

Basin-scale Treatment: Additional levees, additional structures, higher levees, installation of limerock, and additional O & M costs, etc., may be required in order to retrofit the STAs for this alternative. Retrofits of STA-5 and STA-6 to receive Western Reservoir flows will be included as additional costs associated with this alternative.

Alternative 3 – Expand Footprint of STA-5 by Approximately 500 acres to Achieve Lowest Sustainable TP by 12/31/2006

Description:
Basin-scale Treatment: This alternative includes expanding STA-5 footprint by approximately 500 acres to achieve better phosphorus treatment than currently exists, and establishing a composite (i.e., 25/50/25) biological system. New inflow pump stations would be required, and this would also make available an additional 1,000 +/- acres along the western boundary of STA-5 that is presently too high in elevation to be effective treatment area. STA-6 Section 2 would be sized as needed to capture and treat any runoff during the 31-year simulated period that may bypass the expanded STA-5. There may be some loss of capacity in meeting PSTA hydraulic constraints, and therefore in order to avoid bypass, may have to build higher levees to hold water in upstream cells at higher stages. Based on preliminary PSTA research results, this alternative may require the addition of 0.5-2.0 feet of limerock for the PSTA cells. The EAA Western Reservoir may provide some operational benefits beginning in 2009, which would require retrofits to the existing STAs to receive water from the reservoir.

Influence on Flows:
A. **Source Control:** It is assumed that there will be no change in the Baseline flows associated with source controls.
B. **Basin-scale Treatment:** Before the reservoir becomes operational, the STA should receive reduced flows due to the conversion of 500 acres of tributary land to the STA, hence, the Baseline data set flows will be reduced for this alternative. The EAA Western Reservoir, other CERP projects, operational modifications to the Holey Land and Rotenberger Wildlife Management Areas and modifications to the G-404 pump station, may influence discharges from STA-5.

Influence on Water Quality:
A. **Source Control:** As part of the sensitivity analysis, the phosphorus load going into STA-5, as described in the Baseline data set, will be reduced by 5%, 10%, 15% 20% and 25%. Also, the daily phosphorus loads going into STA-6, as contained in the Baseline data set, will be varied over the range –25% to +25%.
B. Basin-scale Treatment: Prior to the reservoir becoming operational, there would be a reduction in phosphorus loads to the STA due to the reduced watershed resulting from expansion of the treatment area and the composite biological system should have better nutrient removal performance than the original STA; hence, the Baseline data set would be adjusted for this alternative. After the reservoir becomes operational, phosphorus loads may be reduced further resulting from the EAA Reservoir operations, and the Baseline loads may be further reduced.

Costs:
Basin-scale Treatment: Additional land, levees, structures, etc. will be required in order to retrofit the STAs for this alternative, including retrofits of STA-5 and STA-6 to receive Western Reservoir flows.

10.0 SUMMARY OF THE ECP BASIN ALTERNATIVES

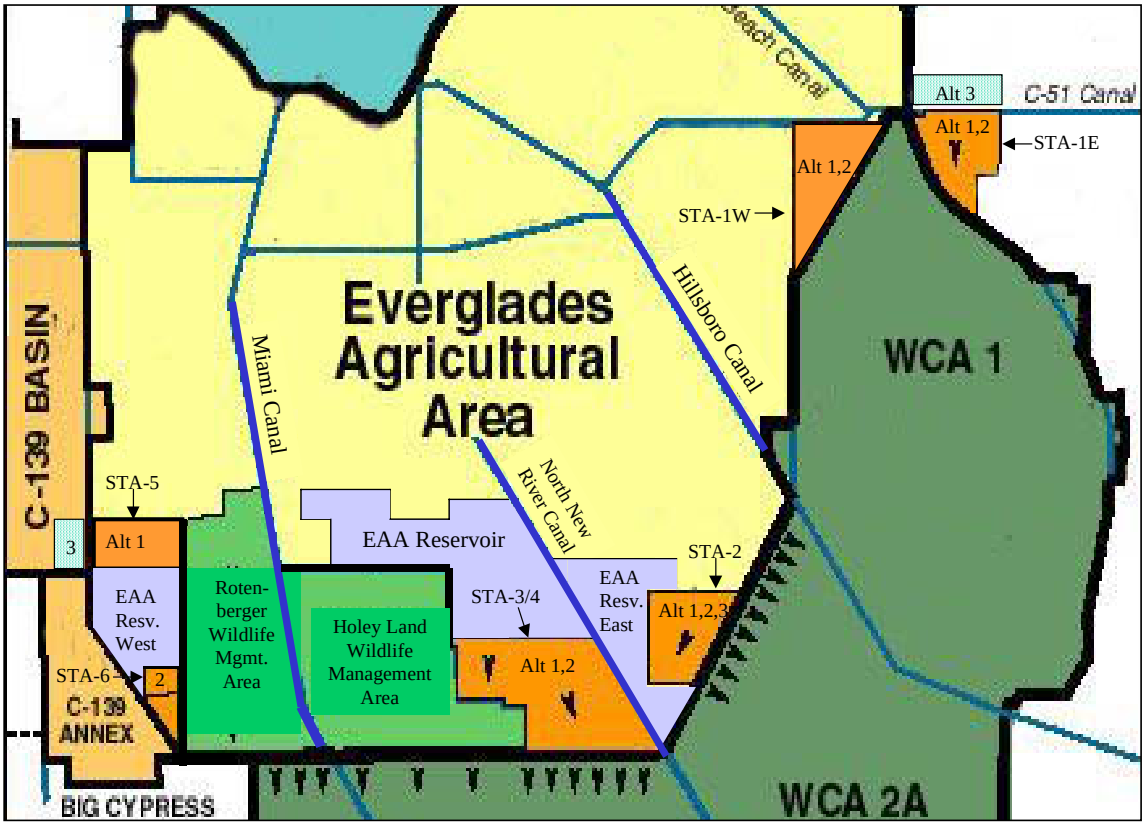


Figure 8. Summary of ECP Basin Alternatives.

Table 2. Preliminary Alternative Combinations

Basin / STA	Alternative	Divert	Source Control	Basin-scale Treatment: Biological	Basin-scale Treatment: Chemical	CERP Project & Date
C-51 West / STA-1 East	1	✔	✔			C-51 and Southern L-8 Reservoir (2014)
	2		✔	✔(within STA footprint)		
	3		✔	✔ (Expand to north)		

Basin / STA	Alternative	Divert	Source Control	Basin-scale Treatment: Biological	Basin-scale Treatment: Chemical	CERP Project & Date
S-5A / STA-1 West	1	✔	✔	✔ (within STA footprint)		C-51 and Southern L-8 Reservoir (2014)
	2		✔	✔ (within STA footprint)		
S-6 / STA-2	1		✔	✔ (within STA footprint)		✔ EAA Reservoirs (2009)
	2		✔	✔ (within STA footprint)		
	3		✔	✔ (within STA footprint)	✔	
S-7, S-8 / STA-3/4	1		✔	✔ (within STA footprint)		✔ EAA Reservoirs (2009)
	2		✔	✔ (within STA footprint)		
C-139 / STA-5 and EAA, C-139 Annex / STA-6 (Sec. 1 & 2)	1		✔	✔ (within STA footprint)		✔ EAA Reservoirs (2009)
	2		✔	✔ (within STA footprint)		
	3		✔	✔ (Expand STA-5 footprint to the west by 500 acres)		